

FISHERY DATA SERIES NO. 64

CREEL CENSUSES IN  
INTERIOR ALASKA IN 1987<sup>1</sup>

By

Timothy T. Baker

Alaska Department of Fish and Game  
Division of Sport Fish  
Juneau, Alaska 99802

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## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES.....	v
LIST OF FIGURES.....	xii
ABSTRACT.....	1
INTRODUCTION.....	2
Background.....	2
Objectives of Creel Census Program.....	5
METHODS.....	5
General Study Design.....	5
General Sampling Procedures.....	7
General Data Collection.....	9
General Data Analysis.....	11
Estimation of Angler Effort.....	11
Estimation of CPUE and HPUE.....	12
Estimation of Harvest.....	14
Analysis of Biological Data.....	15
Analysis of Angler Characteristics and Angler Questionnaires.....	16
CHAPTER 1 - CHATANIKA RIVER ARCTIC GRAYLING FISHERY.....	17
Introduction.....	17
Methods.....	17
Results and Discussion.....	17
CHAPTER 2 - CHATANIKA RIVER WHITEFISH SPEAR FISHERY.....	23
Introduction.....	23
Methods.....	23
Results and Discussion.....	25
Harvest and HPUE Estimates.....	25

TABLE OF CONTENTS (Continued)

	<u>Page</u>
Expanded Harvest Estimates.....	25
Distribution of Angler Harvest, Biological Data, and Demographic Profile.....	27
CHAPTER 3 - CHENA RIVER ARCTIC GRAYLING FISHERY.....	36
Introduction.....	36
Methods.....	36
Results and Discussion.....	39
CHAPTER 4 - CHENA RIVER KING AND CHUM SALMON FISHERY.....	46
Introduction.....	46
Methods.....	46
Results and Discussion.....	46
CHAPTER 5 - DELTA CLEARWATER RIVER GRAYLING FISHERY.....	51
Introduction.....	51
Methods.....	51
Results and Discussion.....	53
CHAPTER 6 - FIELDING LAKE LAKE TROUT AND GRAYLING FISHERY....	60
Introduction.....	60
Methods.....	60
Results and Discussion.....	61
CHAPTER 7 - PAXSON LAKE SUMMER LAKE TROUT FISHERY.....	71
Introduction.....	71
Methods.....	71
Results and Discussion.....	71

TABLE OF CONTENTS (Continued)

	<u>Page</u>
CHAPTER 8 - PILED RIVER SLOUGH RAINBOW TROUT AND GRAYLING FISHERY.....	79
Introduction.....	79
Methods.....	79
Results and Discussion.....	81
CHAPTER 9 - QUARTZ LAKE RAINBOW TROUT AND COHO SALMON FISHERY.....	89
Introduction.....	89
Methods.....	89
Results and Discussion.....	89
CHAPTER 10 - SALCHA RIVER GRAYLING FISHERY.....	97
Introduction.....	97
Methods.....	97
Results and Discussion.....	97
CHAPTER 11 - SALCHA RIVER CHINOOK AND CHUM SALMON FISHERY....	102
Introduction.....	102
Methods.....	102
Results and Discussion.....	102
CHAPTER 12 - SUMMIT LAKE LAKE TROUT FISHERY.....	108
Introduction.....	108
Methods.....	108
Results and Discussion.....	108

TABLE OF CONTENTS (Continued)

	<u>Page</u>
CHAPTER 13 - TANGLE LAKES GRAYLING FISHERY.....	114
Introduction.....	114
Methods.....	114
Results and Discussion.....	116
CHAPTER 14 - WOOD CREEK COHO SALMON FISHERY.....	128
Introduction.....	128
Methods.....	128
Results and Discussion.....	128
ACKNOWLEDGEMENTS.....	136
LITERATURE CITED.....	136

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Creel censuses conducted in the interior of Alaska during 1987.....	6
2. Summary of information collected from creel censuses conducted in the interior of Alaska during 1987.....	8
3. Summary of biological data collected from each fish species encountered during creel censuses in the interior of Alaska during 1987.....	10
4. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of Arctic grayling at the Chatanika River Arctic grayling fishery, 1987.....	20
5. Demographic profile of anglers interviewed at the Chatanika River Arctic Grayling fishery, 1987.....	21
6. Opinions of anglers interviewed at the Chatanika River Arctic grayling fishery, 1987.....	22
7. Estimated annual harvest of whitefish obtained from the Statewide Harvest Survey and on-site creel census of the fall Chatanika River whitefish spear fishery, 1977-1987.....	24
8. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of least cisco at the Chatanika River whitefish spear fishery, 1987.....	28
9. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of humpback whitefish at the Chatanika River whitefish fishery, 1987.....	29
10. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of round whitefish at the Chatanika River whitefish spear fishery, 1987.....	30

LIST OF TABLES (Continued)

<u>Table</u>	<u>Page</u>
11. Estimates of harvest and expanded harvest at the Elliott Highway campground/boat launch area, and ditch area for least cisco, humpback whitefish, round whitefish, and Arctic grayling from the Chatanika River whitefish harvest survey, 1987.....	31
12. Distribution of whitefish harvest among anglers interviewed at the Chatanika River whitefish spear fishery, 1987.....	32
13. Estimated age composition by sex of least cisco and humpback whitefish in the harvest sample from the Chatanika River whitefish spear fishery, 1987.....	33
14. Mean fork length (mm) at age of least cisco and humpback whitefish in the harvest sample from the Chatanika River whitefish spear fishery, 1987.....	34
15. Demographic profile of anglers interviewed at the Chatanika River whitefish spear fishery, 1987.....	35
16. Summary of creel census results for the upper Chena River Arctic grayling fishery, 1970-1987.....	38
17. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of Arctic grayling at the upper Chena River, 1987.....	41
18. Distribution of Arctic grayling catch and harvest among anglers interviewed at the upper Chena River Arctic grayling fishery, 1987.....	42
19. Estimates of the contributions of each age class, mean fork length (mm) at age, and relative stock density (RSD) for Arctic grayling in the harvest sample at the upper Chena River Arctic grayling fishery, 1987.....	43
20. Monthly demographic profiles of anglers interviewed at the upper Chena River Arctic grayling fishery, 1987.....	44
21. Opinions of anglers interviewed at the upper Chena River Arctic grayling fishery, 1987.....	45

LIST OF TABLES (Continued)

<u>Table</u>	<u>Page</u>
22. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of chinook and chum salmon at the lower Chena River chinook and chum salmon fishery, 1987.....	48
23. Demographic profile of anglers interviewed at the lower Chena River chinook and chum salmon fishery, 1987.....	49
24. Opinions of anglers interviewed at the lower Chena River chinook and chum salmon fishery, 1987.....	50
25. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of Arctic grayling at the Delta Clearwater River Arctic grayling fishery, 1987.....	55
26. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Delta Clearwater Arctic grayling fishery, 1987.....	56
27. Estimates of contributions of each age class, mean fork length (mm) at age, and relative stock density (RSD) of Arctic grayling in the harvest sample from the Delta Clearwater Arctic grayling fishery, 1987.....	57
28. Monthly demographic profiles of anglers interviewed at the Delta Clearwater River Arctic grayling fishery, 1987.....	58
29. Opinions of anglers interviewed at the Delta Clearwater River Arctic grayling fishery, 1987.....	59
30. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of Arctic grayling at Fielding Lake and Fielding Lake Outlet, 1987.....	63
31. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of lake trout at Fielding Lake, 1987.....	64
32. Distribution of Arctic grayling and lake trout catch and harvest among anglers interviewed at Fielding Lake, 1987.....	65

LIST OF TABLES (Continued)

<u>Table</u>	<u>Page</u>
33. Estimates of the contributions of each age class, and mean fork length (mm) at age of Arctic grayling in the harvest sample from Fielding Lake and Fielding Lake Outlet, 1987.....	66
34. Relative stock density (RSD) of Arctic grayling in the harvest sample at Fielding Lake and Fielding Lake Outlet, 1987.....	67
35. Demographic profiles of anglers interviewed at the Fielding Lake and Fielding Lake Outlet Arctic grayling fisheries, and Fielding Lake lake trout fishery, 1987.....	68
36. Opinions of anglers interviewed at Fielding Lake lake trout fishery, 1987.....	69
37. Opinions of anglers interviewed at the Fielding Lake and Fielding Lake Outlet Arctic grayling fishery, 1987.....	70
38. Number of anglers interviewed, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) for lake trout at Paxson Lake, 1987.....	74
39. Distribution of lake trout catch and harvest among anglers interviewed that were targeting for lake trout at Paxson Lake, 1987.....	75
40. Estimates of the contributions of each age class, mean fork length (mm) at age, and relative stock density (RSD) of lake trout in the harvest sample at the Paxson Lake lake trout fishery, 1987.....	76
41. Demographic profile of anglers interviewed at the Paxson Lake lake trout fishery, 1987.....	77
42. Opinions of anglers interviewed at the Paxson Lake lake trout fishery, 1987.....	78
43. Number of anglers interviewed, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) for rainbow trout and Arctic grayling at Piledriver Slough, 1987.....	82
44. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Piledriver Slough rainbow trout and Arctic grayling fishery, 1987.....	83

LIST OF TABLES (Continued)

<u>Table</u>	<u>Page</u>
45. Distribution of rainbow trout catch and harvest among anglers interviewed at the Piledriver Slough rainbow trout and Arctic grayling fishery, 1987.....	84
46. Estimates of the contributions of each age class and mean fork length (mm) at age of Arctic grayling in the harvest sample at Piledriver Slough rainbow trout and Arctic grayling fishery, 1987.....	85
47. Relative stock density (RSD) of Arctic grayling and rainbow trout in the harvest sample at Piledriver Slough, 1987.....	86
48. Monthly demographic profiles of anglers interviewed at the Piledriver Slough rainbow trout and Arctic grayling fishery, 1987.....	87
49. Opinions of anglers interviewed at Piledriver Slough rainbow trout and grayling fishery, 1987.....	88
50. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of rainbow trout and coho salmon at Quartz Lake, 1987.....	91
51. Distribution of rainbow trout catch and harvest among anglers interviewed at the Quartz Lake rainbow trout and coho salmon fishery, 1987.....	92
52. Distribution of coho salmon catch and harvest among anglers interviewed at Quartz Lake rainbow trout and coho salmon fishery, 1987.....	93
53. Relative stock densities (RSD) for rainbow trout and coho salmon from harvest samples at Quartz Lake, 1987.....	94
54. Demographic profiles of anglers interviewed at the Quartz Lake rainbow trout and coho salmon fishery, 1987.....	95
55. Opinions of anglers interviewed at the Quartz Lake rainbow trout and coho salmon fishery, 1987.....	96
56. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of Arctic grayling at the Salcha River, 1987.....	99

LIST OF TABLES (Continued)

<u>Table</u>	<u>Page</u>
57. Demographic profile of anglers interviewed at the Salcha River Arctic grayling fishery, 1987.....	100
58. Opinions of anglers interviewed at the Salcha River Arctic grayling fishery, 1987.....	101
59. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of chinook and chum salmon at the Salcha River, 1987.....	104
60. Relative stock density (RSD) of chinook and chum salmon from harvest samples at the Salcha River, 1987.....	105
61. Demographic profile of anglers interviewed at the Salcha River chinook and chum salmon fishery, 1987.....	106
62. Opinions of anglers interviewed at the Salcha River chinook and chum salmon fishery, 1987.....	107
63. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of lake trout at Summit Lake, 1987.....	111
64. Demographic profile of anglers interviewed at the Summit Lake lake trout fishery, 1987.....	112
65. Opinions of anglers interviewed at the Summit Lake lake trout fishery, 1987.....	113
66. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of Arctic grayling at the Tangle River Arctic grayling fishery, 1987.....	118
67. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of Arctic grayling at the Tangle Lakes Arctic grayling fishery, 1987.....	119
68. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Tangle River Arctic grayling fishery, 1987.....	120

LIST OF TABLES (Continued)

<u>Table</u>	<u>Page</u>
69. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Tangle Lakes Arctic grayling fishery, 1987.....	121
70. Estimates of the contributions of each age class and mean fork length (mm) at age of Arctic grayling in the harvest sample at the Tangle Lakes and River Arctic grayling fishery, 1987.....	122
71. Relative stock densities (RSD) of Arctic grayling in the harvest sample at the Tangle Lakes and River, 1987.....	123
72. Demographic profiles of anglers interviewed at Tangle Lakes and River Arctic grayling fishery, 1987.....	124
73. Opinions of anglers interviewed at the lower Tangle Lakes Arctic grayling fishery, 1987.....	125
74. Opinions of anglers interviewed at the upper Tangle Lakes Arctic grayling fishery, 1987.....	126
75. Opinions of anglers interviewed at the Tangle River Arctic grayling fishery, 1987.....	127
76. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of anadromous coho salmon at Wood Creek, 1987.....	131
77. Distribution of anadromous coho salmon catch and harvest among anglers interviewed at the Wood Creek coho salmon fishery, Nenana River drainage, 1987.....	132
78. Relative stock density (RSD) of anadromous coho salmon from the harvest sample at Wood Creek coho salmon fishery, 1987.....	133
79. Demographic profile of anglers interviewed at the Wood Creek coho salmon fishery, 1987.....	134
80. Opinions of anglers interviewed at the Wood Creek coho salmon fishery, 1987.....	135

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Map of Arctic-Yukon-Kuskokwim (AYK) Region and Tanana River drainage sport fishery management areas, Alaska..	3
2. Effort and harvest by recreational anglers in the AYK Region (includes Tanana River drainage) and Tanana River drainage sport fishery management areas, 1977-1986 (Mills 1978-1987).....	4
3. Location of Chatanika River Arctic grayling fishery, and whitefish spear fishery, Tanana River drainage, Alaska.....	18
4. Location of the upper Chena River Arctic grayling fishery and lower Chena River chinook and chum salmon fishery, Tanana River drainage, Alaska.....	37
5. Location of the Delta Clearwater River Arctic grayling fishery, Tanana River drainage, Alaska.....	52
6. Location of the Paxson Lake lake trout and Arctic grayling fisheries, Copper River drainage, Alaska.....	72
7. Location of Piledriver Slough, Tanana River drainage, Alaska.....	80
8. Location of Salcha River Arctic grayling fishery, and chinook and chum salmon fishery, Tanana River drainage, Alaska.....	98
9. Location of Summit Lake, Copper River drainage, Alaska.....	109
10. Location of the Tangle Lakes system, Tanana River drainage, Alaska.....	115
11. Location of Wood Creek coho salmon fishery, Nenana River drainage, Alaska.....	129

## ABSTRACT

During 1987, creel censuses were conducted on 11 of the major fisheries within the Tanana Drainage, two within the Gulkana Drainage, and one within the Nenana Drainage by Arctic-Yukon-Kuskokwim Region, Sport Fish Division personnel. Angler effort, catch per unit effort, harvest per unit effort, catch, and harvest were estimated for seven of these fisheries. Catch per unit effort and harvest per unit effort were estimated for the other seven fisheries. Age composition, mean length-at-age, and relative stock density were estimated for the major species encountered at each fishery. Angler demographics and angler opinions about the fisheries and their management were recorded for all 14 fisheries.

The following fish species were encountered during these creel censuses: Arctic char *Salvelinus alpinus*, Arctic grayling *Thymallus arcticus*, anadromous chinook salmon *Oncorhynchus tshawytscha*, anadromous and landlocked coho salmon *Oncorhynchus kisutch*, anadromous chum salmon *Oncorhynchus keta*, burbot *Lota lota*, Dolly Varden *Salvelinus malma*, humpback whitefish *Coregonus pidschian*, lake trout *Salvelinus namaycush*, least cisco *Coregonus sardinella*, northern pike *Esox lucius*, rainbow trout *Salmo gairdneri*, and round whitefish *Prosopium cylindraceum*.

KEY WORDS: creel census, catch, harvest, catch per unit effort, harvest per unit effort, angler effort, angler demographics, angler questionnaires, angler surveys, age composition, length-at-age, interior Alaska, Tanana River drainage.

## INTRODUCTION

### Background

The Arctic-Yukon-Kuskokwim (AYK) Region encompasses an area that covers almost two-thirds of the state of Alaska and includes all of Alaska north of Bristol Bay and the Alaska Range (Figure 1). Within this area, the state's largest river systems (Yukon, Kuskokwim, Colville, and Noatak) are found, along with thousands of lakes, and thousands of miles of streams. These waters support a large number of recreational fisheries for both freshwater and anadromous fish species that include Arctic char *Salvelinus alpinus*, Arctic grayling *Thymallus arcticus*, anadromous chinook salmon *Oncorhynchus tshawytscha*, anadromous and landlocked coho salmon *Oncorhynchus kisutch*, anadromous chum salmon *Oncorhynchus keta*, burbot *Lota lota*, Dolly Varden *Salvelinus malma*, humpback whitefish *Coregonus pidschian*, lake trout *Salvelinus namaycush*, least cisco *Coregonus sardinella*, northern pike *Esox lucius*, rainbow trout *Salmo gairdneri*, and round whitefish *Prosopium cylindraceum*.

For sport fishery management purposes, the AYK Region is divided into two areas, the Tanana River drainage (includes all waters within the Tanana River drainage), and the AYK Area (includes all waters outside the Tanana River drainage) (Figure 1). From 1977 to 1982, angling effort in the AYK Region and Tanana River drainage increased at an annual rate of about 10% (Figure 2). During the same time period, harvest of all species increased about 19% annually (Figure 2). Since 1982, effort and harvest by sport anglers have leveled off in both the Tanana River drainage and AYK Region (Figure 2).

Even though the AYK Region encompasses a very large area, the majority (approximately 75%) of the recreational angler effort and harvest occurs near the major population centers (Fairbanks, Delta Junction, and Tok) within the Tanana River drainage (Figures 1 and 2). The leveling off of recreational angler effort and harvest that has occurred since 1982 are probably due to the overharvest of the major species in the Tanana River drainage and due to the current economic downturn in Alaska. In the near future, angler effort and harvest are expected to increase as the human population around the Tanana River drainage grows and the Alaskan economy starts to recover.

With angler effort and harvest expected to increase, the monitoring of the Tanana River drainage recreational fisheries becomes especially important. Many of the Tanana River drainage fisheries (i.e. Chena River, Delta Clearwater River, and Shaw Creek grayling fisheries) are already showing signs of over-exploitation (i.e. decreasing population abundance, decreasing mean length-at-age, and shifts in the age structure) (Holmes et al. 1986). In other Tanana Drainage fisheries (i.e. rapidly developing burbot, lake trout, and northern pike fisheries), the stock status and the present level of harvest are so poorly understood that no estimate of the effect of angler effort on these stocks is currently possible. On other waters, newly developing sport fisheries (Chena and Salcha rivers chinook salmon) are causing allocation conflicts with existing commercial and subsistence fisheries. The Alaska Board of Fisheries has recently implemented new management regulations (i.e. season closures, size limits, gear restrictions, reductions of bag limits) on a large portion of the major fisheries in the

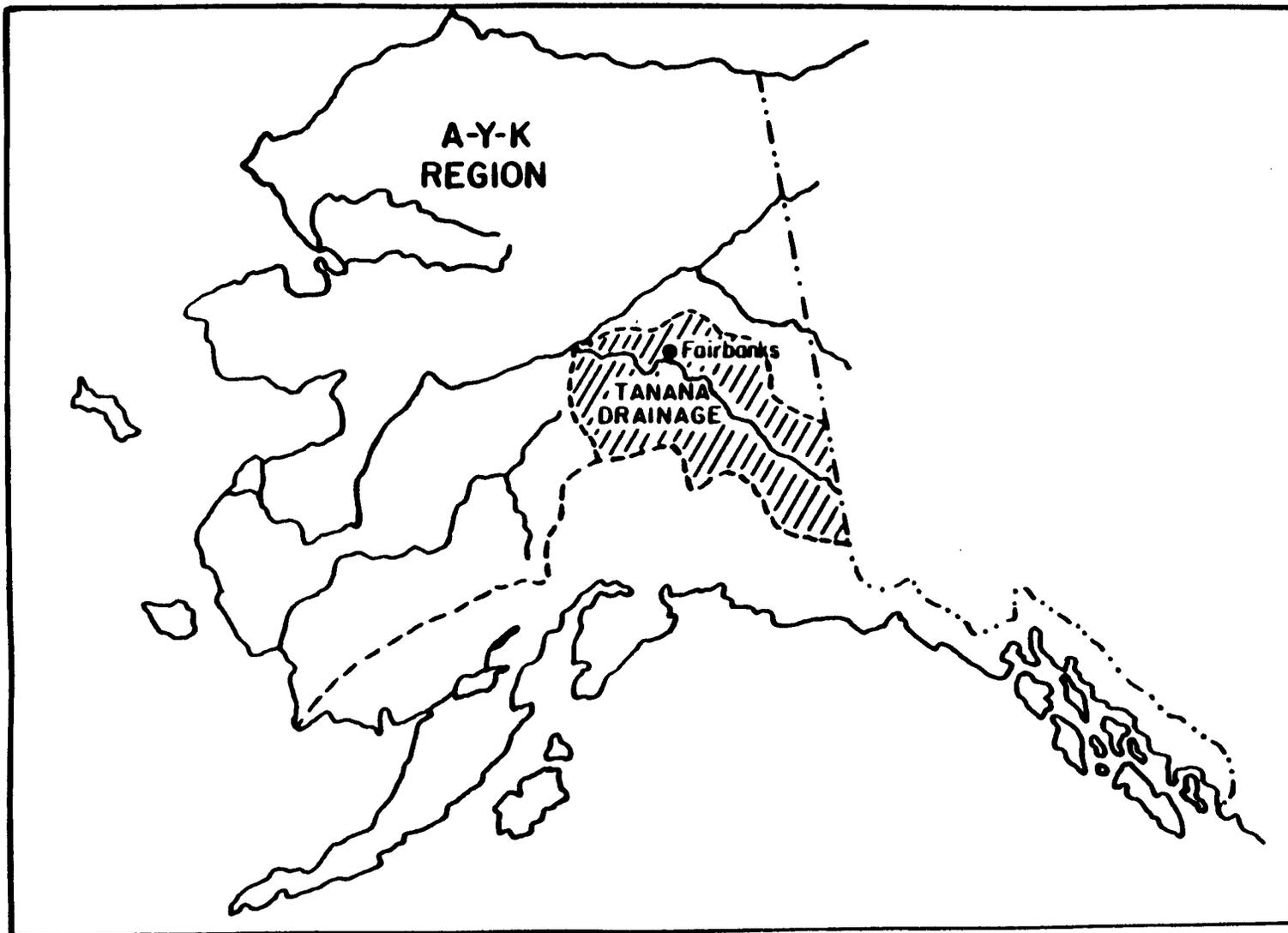


Figure 1. Map of Arctic-Yukon-Kuskokwim (AYK) Region and Tanana River drainage sport fishery management areas, Alaska.

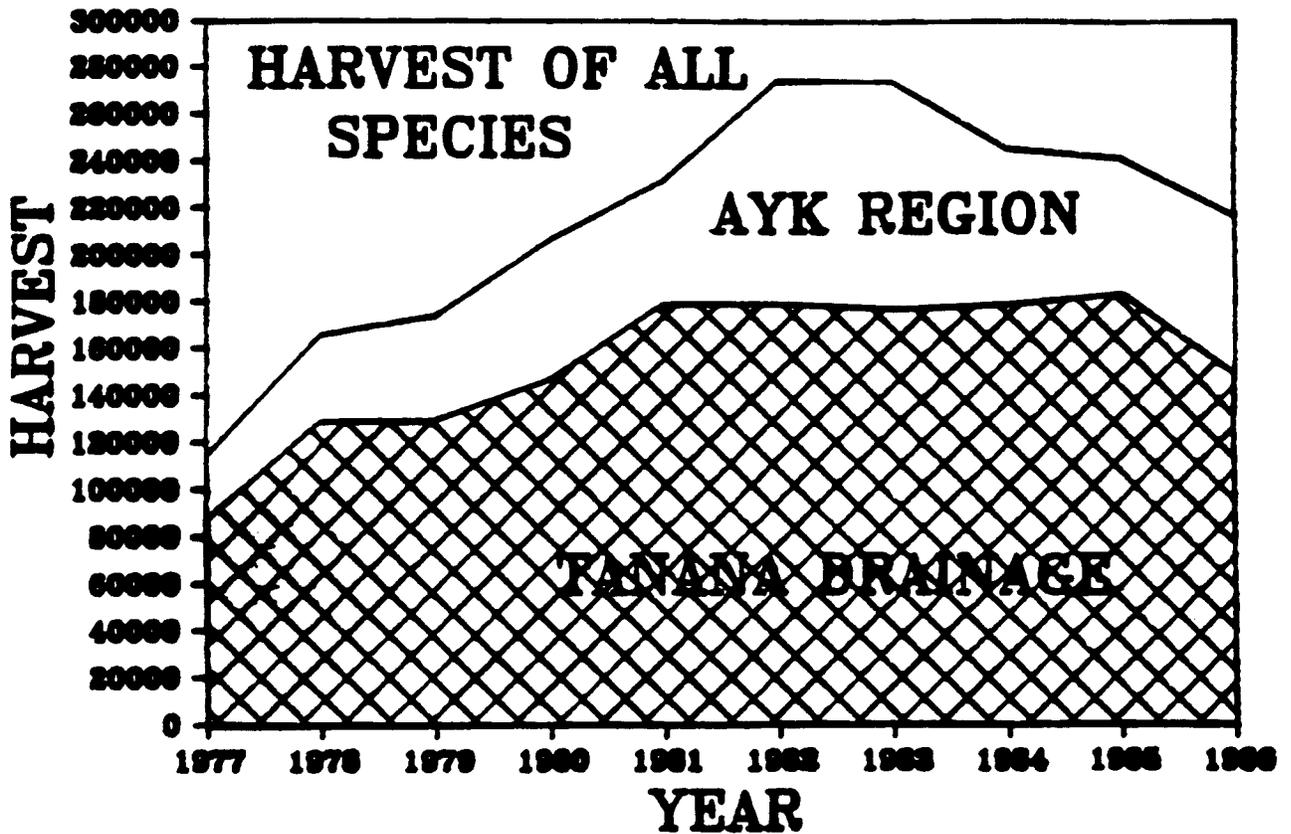
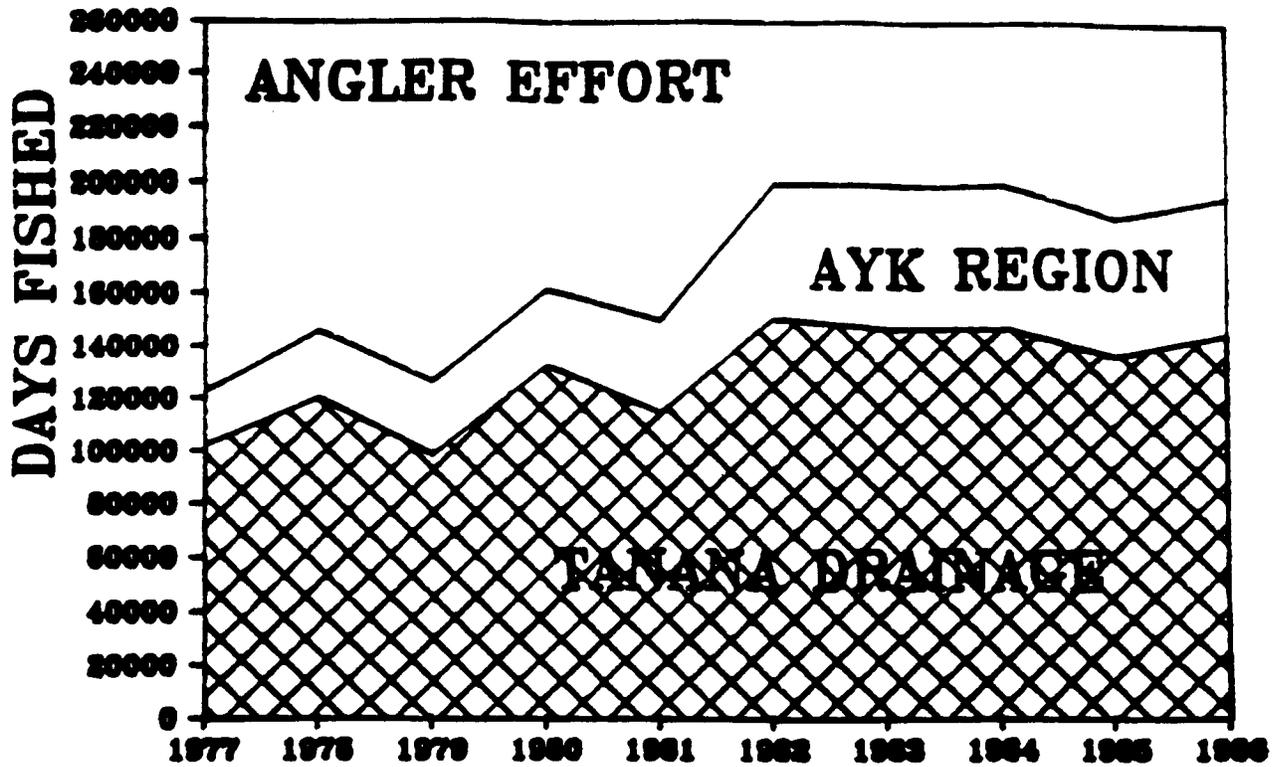


Figure 2. Effort and harvest by recreational anglers in the AYK Region (includes Tanana River drainage) and Tanana River drainage sport fishery management areas, 1977-1986 (Mills 1978-1987).

Tanana River drainage. Because of all of these activities, the monitoring of these fisheries has become especially important. One of the most effective ways to monitor these fisheries is through the use of creel censuses.

In this annual report, I present a comprehensive analysis of the creel censuses that were conducted by Sport Fish Division, Alaska Department of Fish and Game (ADF&G) in Region III (AYK Region) during 1987. Many of the same sampling techniques and estimation procedures have been utilized for all the creel censuses. However, there also were many techniques and procedures that were specific to each creel census. For this reason, a general methods section is first presented that includes the general sampling techniques and estimation procedures utilized during the creel censuses. A separate chapter is then presented for each creel census. Each chapter contains introduction, methods, and results and discussion sections that are specific to each creel census.

### Objectives of Creel Census Program

Creel censuses were conducted at 11 of the major fisheries within the Tanana River drainage, two within the Copper River drainage (Region II), and one within the Nenana River drainage by AYK Region Sport Fish personnel during 1987. The specific objectives of the creel censuses were to provide information concerning harvest, catch, angler effort, catch per hour (CPUE), harvest per hour (HPUE), and biological data (i.e. mean length, and mean age of harvested fish). At most of these fisheries, some additional information was obtained that includes: catch distribution among user groups, temporal and spatial use patterns, angler characteristics (i.e. sex, residency), angler opinions concerning management of a fishery, sport fishery impacts on indigenous stocks, stocked fish contribution to a fishery, and the effectiveness of in-season management decisions.

The long term goals of the creel census program are to: (1) develop a historical database to allow monitoring of both the recreational fisheries and the exploited fish populations; (2) develop regulations that reflect the desires of the angling public while ensuring the sustained health of the resource; and (3) determine the effects of management regulations on the fisheries, fish populations, and recreational angling public.

## METHODS

### General Study Design

There are two types of creel censuses that are conducted in the AYK Region (Table 1). The first are harvest surveys in which angler effort, catch, harvest, CPUE, and HPUE are estimated. The second type of creel censuses are CPUE surveys, in which only CPUE and HPUE are estimated. Age and length data and angler information are collected during all creel censuses. Sampling procedures used in all harvest surveys are essentially the same and sampling procedures for CPUE surveys are all the same. A description of the general sampling procedures and data collection utilized during these studies are presented below.

Table 1. Creel censuses conducted in the interior of Alaska during 1987.

Location	Species <sup>1</sup>	Type of Creel Census	Creel Census Information		
			A-L <sup>2</sup>	CPUE/ Ang. Inf.	Effort/ Harvest
Chatanika River	GR	CPUE	X	X	
Chatanika River	LC,HW,RW	Harvest	X	X	X
Chena River	GR	CPUE	X	X	
Chena River	KS,CS	CPUE	X	X	
Delta Clearwater River	GR	Harvest	X	X	X
Fielding Lake	LT,GR,BB	Harvest	X	X	X
Paxson Lake	LT,GR,BB	CPUE	X	X	
Piledriver Slough	RT,GR	CPUE	X	X	
Quartz Lake	RT,SS <sup>3</sup>	Harvest	X	X	X
Salcha River	GR	CPUE	X	X	
Salcha River	KS,CS	Harvest	X	X	X
Summit Lake	LT,BB	CPUE	X	X	
Tangles Lakes and River	GR,LT,BB	Harvest	X	X	X
Wood Creek	SS <sup>4</sup>	Harvest	X	X	X

- <sup>1</sup> BB = Burbot, CS = Chum Salmon, GR = Arctic Grayling,  
 HW = Humpback Whitefish, KS = Chinook Salmon, LC = Least Cisco,  
 LT = Lake Trout, RT = Rainbow Trout, RW = Round Whitefish,  
 SS = Coho Salmon.
- <sup>2</sup> Age and length data.
- <sup>3</sup> Landlocked coho salmon.
- <sup>4</sup> Anadromous coho salmon.

## General Sampling Procedures

All creel censuses are based upon a stratified random sampling design. The strata in each fishery are defined to increase the relative precision of the estimates of angler effort (i.e. levels of angler effort are expected to be similar within a stratum) and are based upon historical creel census data (when available). The number of angler counts and angler interviews collected in each fishery are determined by the amount of creel census technician time available each month and an estimate of the minimum number of samples needed to achieve the desired level of precision according to procedures described by Cochran (1977). Allocation of sampling effort among strata in a fishery are determined by optimal allocation based on strata variances (assuming constant costs for collection among strata). Variance estimates for strata are from the most recent creel census conducted for a fishery.

Angler effort is only estimated for harvest surveys. Angler effort is estimated from angler counts conducted at randomly selected time periods within a stratum. None of the angler counts in harvest surveys take more than 1 hour to complete. For this reason, the angler counts are considered to be instantaneous estimates of the number of anglers present (Nuehold and Lu 1957). Both roving and/or stationary creel censuses are used depending upon the fishery. Roving creel censuses are used in fisheries with many access points and/or that cover a large geographic area. Stationary creel censuses are used in fisheries with a small number of access points.

Angler interviews are conducted during both harvest and CPUE surveys. During harvest surveys, a creel census technician's time is split between angler counts and interviews. However, only angler interviews are conducted during CPUE surveys. Angler interviews are used to collect the following information: CPUE, HPUE, angler characteristics (i.e. sex), and biological data from harvested fish.

The sampling schedule for a creel census is developed by determining the number of sample periods in each stratum. Sample periods are defined as the time allocated to collect a sample. The sample periods are then numbered consecutively for an entire month. The periods to be sampled in each stratum are selected from a random number table by drawing the numbers without replacement until the number of sample periods designated for that stratum has been reached. This procedure is completed independently for each stratum. The length of the sample period (hours needed to conduct angler count(s) and/or angler interview(s)) for each fishery is based upon the type of count (roving or stationary) and the estimated time required to obtain a sufficient number of interviews (for stationary creel censuses) or to sufficiently cover the entire fishery area (roving creel censuses). Multiple angler counts are conducted during some sampling periods. For multiple counts, a randomly selected time during each hour of the sample period is selected for an angler count. The basic design of each creel census is summarized in Table 2.

Table 2. Summary of information collected during creel censuses conducted in the interior of Alaska during 1987.

Fishery	Time Period	Number of Strata	Hours in Sample Unit	Completed/Incomplete	Roving/Stationary	Angler Types
Chatanika River						
Grayling	May 18 - Jun 31	2	2	Both	Stationary	Shore
Whitefish	Sep 11 - Oct 18	2	6	Both	Roving	Bt/Sh
Chena River						
Grayling	May 18 - Sep 15	4	2 and 3	Both	Roving	Shore
Chinook and Chum Salmon	Jul 11 - Jul 18	2	2	Both	Roving	Bt/Sh
Delta Clearwater River	Jun 6 - Sep 7	6	4	Both	Roving	Bt/Sh
Fielding Lake	Jun 15 - Aug 31	2	4	Completed	Stationary	Bt/Sh
Paxson Lake <sup>1</sup>	Jun 15 - Aug 31	2	4	Completed	Stationary	Bt/Sh
Piledriver Slough	Apr 25 - Aug 31	3	2	Both	Roving	Shore
Quartz Lake	May 1 - Aug 31	2	3	Completed	Stationary	Bt/Sh
Salcha River						
Grayling	May 1 - Aug 31	2	2	Both	Stationary	Bt/Sh
Chinook and Chum Salmon	Jul 1 - Jul 28	2	3	Completed	Stationary	Bt/Sh
Summit Lake <sup>1</sup>	Jun 15 - Aug 31	2	4	Completed	Stationary	Bt/Sh
Tangle Lakes and River	Jun 15 - Aug 31	2	4	Completed	Stationary	Bt/Sh
Wood Creek <sup>2</sup>	Sep 25 - Oct 12	2	4	Completed	Stationary	Shore

<sup>1</sup> Paxson and Summit lakes are located in the Gulkana River drainage, Southcentral Region. However, the creel censuses were conducted by Sport Fish Division personnel from the AYK Region.

<sup>2</sup> Wood Creek coho salmon fishery is located in the Nenana River drainage.

## General Data Collection

Only anglers actively fishing are counted during angler counts. For roving angler counts, the creel census technician counts anglers while traveling from one end of the fishery to the other (the direction of travel for the angler count is determined randomly) at a constant rate of speed. Stationary angler counts are made from one to three vantage points, depending on the fishery, where the entire fishery can be seen. Angler counts are recorded on Alaska Department of Fish and Game Angler Count Form Version 1.1.

Angler interviews are conducted for each individual angler contacted. The angler interviews are either complete or incomplete-trip interviews. Completed trip angler interviews are preferred. However, the majority of the angler interviews conducted during roving creel censuses occur prior to the completion of the fishing trip. Almost all the interviews obtained during stationary creel censuses are from anglers who have completed their fishing trip. All anglers present during a sample period are interviewed if possible. Anglers are randomly selected for interviews if all the anglers present cannot be interviewed during the sample period.

During each interview, anglers are asked the following:

- 1) the length of time spent fishing;
- 2) the number of fish caught by species;
- 3) the number of fish caught and kept by species; and
- 4) angler characteristics that include;
  - a) male or female,
  - b) youth or adult,
  - c) resident or nonresident,
  - d) local or nonlocal,
  - e) tourist or military, and
  - f) type of terminal fishing gear.

In addition, anglers are asked several questions regarding management strategies and regulations. At all fisheries, the anglers are asked to rate the quality of fishing as either excellent, good, fair, or poor. In addition, specific questions about the fishery, and/or current or proposed management strategies and regulations are asked. All angler interview data are recorded on Alaska Department of Fish and Game Angler Interview Form (Version 1.1).

Biological data (i.e. fork length, age) are collected for all fish encountered during a creel census. It is necessary to sample all fish to obtain the needed sample sizes to achieve the specified level of relative precision. The mid-eye to fork of tail length is measured for all salmon species and fork length (tip of snout to fork of tail) is measured for all other species (Table 3). All length measurements are made to the nearest millimeter. Scales are collected as aging structures from all recreational fish species encountered, except burbot (Table 3). Also, different aging structures (otoliths, vertebra, cleithra, opercles) are collected from each species of fish. A list of the aging structures collected by species is provided in Table 3. All biological data are recorded on the Alaska Department of Fish and Game Standard Age Weight Length Form Version 1.1.

Table 3. Summary of biological data collected from each fish species encountered during creel censuses in the interior of Alaska during 1987.

Species	Type of length Measurement	Age Structure
Arctic Grayling	Fork length	Scales
Burbot	Fork length	Otoliths, Vertebrae
Chinook Salmon	Mid-eye to fork of tail	Scales
Chum Salmon	Mid-eye to fork of tail	Scales
Coho Salmon <sup>1</sup>	Mid-eye to fork of tail	Scales
Coho Salmon <sup>2</sup>	Fork length	Scales
Lake Trout	Fork length	Scales, Otoliths
Northern Pike	Fork length	Scales
Rainbow Trout	Fork length	Scales
Whitefish <sup>3</sup>	Fork length	Scales

<sup>1</sup> Anadromous coho salmon.

<sup>2</sup> Landlocked coho salmon.

<sup>3</sup> Includes least cisco, humpback whitefish, and round whitefish.

## General Data Analysis

Estimation of angler effort, CPUE, HPUE, catch, and harvest is based upon the expansion of sample period angler counts, catch, harvest, and angler effort to the entire stratum. The following data analyses are used to estimate the primary parameters of the fishery: total angler effort, CPUE, HPUE, catch and harvest.

Estimation of Angler Effort:

The mean number of anglers per count in stratum  $i$  ( $\bar{x}_i$ ) for each fishery is:

$$(1) \quad \bar{x}_i = \frac{1}{n_i} \sum_{h=1}^{n_i} x_{hi} ,$$

where:

$x_{hi}$  = number of anglers counted during count  $j$  in stratum  $i$ , and

$n_i$  = total number of counts in stratum  $i$ .

The sampling variance estimate of  $\bar{x}_i$  ( $\hat{V}[\bar{x}_i]$ ) is:

$$(2) \quad \hat{V}[\bar{x}_i] = \frac{1}{n_i - 1} \sum_{h=1}^{n_i} (x_{hi} - \bar{x}_i)^2 .$$

The mean number of anglers per hour ( $\bar{X}$ ) is calculated by:

$$(3) \quad \bar{X} = \frac{1}{N} \sum_{i=1}^L N_i \bar{x}_i ,$$

where:

$N_i$  = number of hours in stratum  $i$ ,

$N$  = total number of hours in the fishery, and

$L$  = total number of strata in the fishery.

The sampling variance of the mean number of anglers per hour ( $\hat{V}[\bar{X}]$ ) is estimated by:

$$(4) \quad \hat{V}[\bar{X}] = \frac{1}{N^2} \sum_{i=1}^L N_i^2 \frac{(N_i - n_i)}{N_i} \hat{V}[\bar{x}_i] .$$

The total number of angler hours ( $E_i$ ) in stratum  $i$  for each fishery is estimated by (Lambou 1961):

$$(5) \quad \hat{E}_i = N_i \bar{x}_i,$$

and, the estimate of the total number of angler hours ( $\hat{E}_T$ ) in each fishery is:

$$(6) \quad \hat{E}_T = N\bar{X} = \sum_{i=1}^L E_i.$$

The estimate of the variance for total angler hours ( $\hat{V}[E_T]$ ) is:

$$(7) \quad \hat{V}[E_T] = N^2 V[\bar{X}].$$

Estimation of CPUE and HPUE:

The method for estimating CPUE and HPUE for a species is determined by first testing the hypothesis that CPUE and HPUE from incomplete trip angler interviews are not significantly different than estimates of CPUE and HPUE from complete trip angler interviews. This hypothesis is tested by comparing the CPUE and HPUE from incomplete and complete trips from the same fishery and stratum. For a specific fishery, species, and stratum, CPUE and HPUE are estimated for complete and incomplete trips by the jackknife procedure (Efron 1982):

$$(8) \quad \overline{\text{CPUE}}_{ik} = \frac{1}{a_i - 1} \left[ \frac{\sum_{j \neq k} c_{ij}}{\sum_{j \neq k} e_{ij}} \right] \Bigg|_{k=1}^{a_i},$$

where:

$\overline{\text{CPUE}}_{ik}$  = mean CPUE of all anglers interviewed during stratum  $i$ , excluding the  $k$ th angler,

$a_i$  = number of anglers interviewed during stratum  $i$ ,

$c_{ij}$  = catch of angler  $j$  interviewed during stratum  $i$ ,

$e_{ij}$  = effort (hours fished) of angler  $j$  interviewed during stratum  $i$ , and

$k = 1, 2, 3, \dots, a_i$ ;

and,

$$(9) \quad CPUE_i = \frac{1}{a_i} \sum_{k=1}^{a_i} \overline{CPUE_{ik}},$$

where:

$CPUE_i$  = jackknife CPUE of anglers interviewed during stratum i.

$\overline{HPUE_{ik}}$  is estimated by substituting  $h_{ij}$  for  $c_{ij}$  in equation (8),

where:

$\overline{HPUE_{ik}}$  = mean HPUE of all anglers interviewed during stratum i, excluding the kth angler, and

$h_{ij}$  = harvest of angler j during stratum i.

The jackknife HPUE of anglers interviewed during stratum i ( $HPUE_i$ ), is estimated by substituting  $\overline{HPUE_{ik}}$  for  $CPUE_{ik}$  in equation (9).

Omitting the finite population correction factor, the variance of  $CPUE_i$  is estimated by the jackknife procedure:

$$(10) \quad \hat{V}[CPUE_i] = \frac{a_i - 1}{a_i} \sum_{k=1}^n (\overline{CPUE_{ik}} - CPUE_i)^2,$$

where:

$\hat{V}[CPUE_i]$  = jackknife variance of  $CPUE_i$  of anglers interviewed during stratum i.

The variance of  $HPUE_i$  is estimated by substituting  $HPUE_i$  and  $\overline{HPUE_{ik}}$  for  $CPUE_i$  and  $CPUE_{ik}$  in equation (10),

where:

$V[HPUE_i]$  = jackknife variance of  $HPUE_i$  of anglers interviewed during stratum i.

A review was made and an independent t-test used, when needed, to test the hypothesis that incomplete trip angler interviews provided unbiased estimates of complete trip angler interviews. If the hypothesis was not rejected, I estimated  $CPUE_i$  and  $HPUE_i$  (and their variances) using equations 8, 9 and 10 with complete and incomplete trip angler interviews pooled. If the hypothesis was rejected, then I calculated  $CPUE_i$ ,  $HPUE_i$ , and their variances with complete trip angler interviews only (as above with equations 8, 9, and 10).

Finite population correction factors are applied to  $V(CPUE_i)$  and  $V(HPUE_i)$  when the total number of anglers in stratum i of a fishery can be estimated (harvest surveys only). The finite population correction factor for  $V[CPUE_i]$  and  $V[HPUE_i]$  are estimated by:

$$(11) \quad \hat{A}_i = \frac{N_i \bar{x}_i}{\frac{1}{a_i} \sum_{j=1}^{a_i} e_{ij}},$$

and,

$$(12) \quad \hat{f}_i = 1 - \frac{a_i}{\hat{A}_i},$$

where:

$\hat{A}_i$  = estimate of the total number of anglers fishing during stratum  $i$ , and

$\hat{f}_i$  = finite population correction factor for  $V(\text{CPUE}_i)$  and  $V(\text{HPUE}_i)$ .

Therefore, the estimate of  $V[\text{CPUE}_i]$  becomes:

$$(13) \quad \hat{V}[\text{CPUE}_i] = \hat{f}_i \hat{V}[\text{CPUE}_i],$$

and the estimate of  $V[\text{HPUE}_i]$  becomes:

$$(14) \quad \hat{V}[\text{HPUE}_i] = \hat{f}_i \hat{V}[\text{HPUE}_i].$$

Estimation of Harvest:

The total catch for a species ( $C_T$ ) and total harvest for a species ( $H_T$ ) are estimated by:

$$(15) \quad C_T = \sum_{i=1}^L \hat{E}_i \text{CPUE}_i,$$

and,

$$(16) \quad H_T = \sum_{i=1}^L \hat{E}_i \text{HPUE}_i.$$

The variance of  $C_T$  and  $H_T$  (assuming strata estimates are independent) are estimated from the formula for the product of two random variables (Goodman 1960):

$$(17) \quad \hat{V}[C_T] = \sum_{i=1}^L \hat{V}[E_i CPUE_i],$$

$$- \sum_{i=1}^L \left[ \hat{E}_i^2 \hat{V}[CPUE_i] + CPUE_i^2 \hat{V}[E_i] - \hat{V}[E_i] \hat{V}[CPUE_i] \right],$$

and,

$$(18) \quad \hat{V}[H_T] = \sum_{i=1}^L \hat{V}[E_i HPUE_i],$$

$$- \sum_{i=1}^L \left[ \hat{E}_i^2 \hat{V}[HPUE_i] + HPUE_i^2 \hat{V}[E_i] - \hat{V}[E_i] \hat{V}[HPUE_i] \right],$$

The assumptions necessary for these analyses are:

- (1) incomplete trip angler interviews provide an unbiased estimate of completed trip angler interviews in roving creel censuses;
- (2) interviewed anglers are representative of the total angler population;
- (3) no significant fishing effort occurs outside the defined fishing day; and,
- (4) anglers are interviewed in approximate proportion to their abundance in any given sample unit.

Analysis of Biological Data:

For each species encountered during a creel census, percent age composition and mean fork length (mm) at age of fish harvested are estimated. The normal theory approximation of the binomial distribution is used to estimate standard error for the percentages by age group.

Relative Stock Density (RSD) is estimated for the harvest of each species in a fishery (Gablehouse 1984). Gablehouse (1984) set forth the RSD length categorization system to assess the structure of fish stocks using five length categories. Each length category is unique for a species. The minimum length of each RSD category is a percentage of the recorded world record length for a species (listed by the International Game Fish Association). The five length categories are stock (20%-26% of world record length), quality (36%-41% of world record length), preferred (45%-55% of world record length), memorable (59%-64% of world record length), and trophy (74%-80% of world record length) length classes. Each RSD category is a percentage of harvested fish that are over the minimum stock length and fall within each RSD category. The normal theory approximation of the binomial distribution is used to establish standard error for the percentage of each RSD category.

### Analysis of Angler Characteristics and Angler Questionnaires:

For each fishery, angler demographics are calculated from angler interviews as a percentage of the following: male/female, adult/youth, resident/non-resident, local/non-local, tourist/military/neither, and terminal gear types used. At all fisheries, anglers interviewed are asked to rate the quality of fishing at a particular fishery. A mean rating is then calculated for each fishery from the following scale: Excellent = 1, Good = 2, Fair = 3, and Poor = 4. In addition, questions specific to each fishery are asked of anglers interviewed. Number and percent opinions to all these questions are calculated. The normal approximation of the binomial distribution is used to calculate the standard error for the calculated percentages.

## CHAPTER 1 - CHATANIKA RIVER ARCTIC GRAYLING FISHERY

### Introduction

The Chatanika River is located north of Fairbanks and can be accessed by both the Steese and Elliott Highways (Figure 3). The Chatanika River supports a summer Arctic grayling fishery. Turbidity from placer mining on tributary streams caused a reduction in Arctic grayling harvest in recent years, although the harvest of Arctic grayling was 7,404 in 1985 (Mills 1986). Very little information is available concerning the Chatanika River Arctic grayling fishery. For this reason, a preliminary creel census was conducted in 1987 to provide baseline information on CPUE, HPUE, angler demographics, and harvest sample information for the Chatanika River Arctic grayling fishery..

Access to the Chatanika River is provided at numerous roadside parking areas on the Steese Highway, and at two bridges (one on each of the two highways). Almost all of the fishing is from shore. There are a small number of anglers that take float trips between the two bridges. The creel census was conducted near the Elliott Highway. A state campground and boat launch facility are located at the Elliott Highway bridge.

### Methods

This creel census is a stationary CPUE survey. The Chatanika River Arctic grayling CPUE survey was performed in conjunction with the upper Chena River Arctic grayling harvest survey. This survey was split into two strata: (1) weekdays 0800 hours to 2200 hours, and (2) weekends/holidays 0800 hours to 2200 hours. Since no previous creel censuses had been conducted on this fishery, allocation of sample periods followed that of the upper Chena River: 65% was allocated to strata 1, and 35 % to strata 2. The sample period is 2 hours. This CPUE survey was scheduled to be from 1 May through 31 August 1987.

The field sampling procedure for a sample period is started by randomly selecting either the time period before or after the chosen sample period for the upper Chena River harvest survey. The creel clerk spends an equal amount of time at the two access areas (campground and boat launch) conducting angler interviews and sampling the harvest. The majority of the angler interviews are from complete trips.

### Results and Discussion

Because of the small number of anglers encountered (30 angler interviews), the creel census was only conducted from 18 May through 30 June 1987. Of the 30 anglers interviewed, 11 were complete trip interviews and 19 were incomplete trip interviews (Table 4). Mean CPUE and HPUE for the time period were 0.21 and 0.02 Arctic grayling per hour, respectively. However, no fish were caught in the last 2 weeks of May.

A demographic profile of the anglers interviewed at the Chatanika River Arctic grayling fishery shows that the majority of the anglers were male (83%), adult (87%), residents of the State of Alaska (80%), live near Fairbanks (80%), and

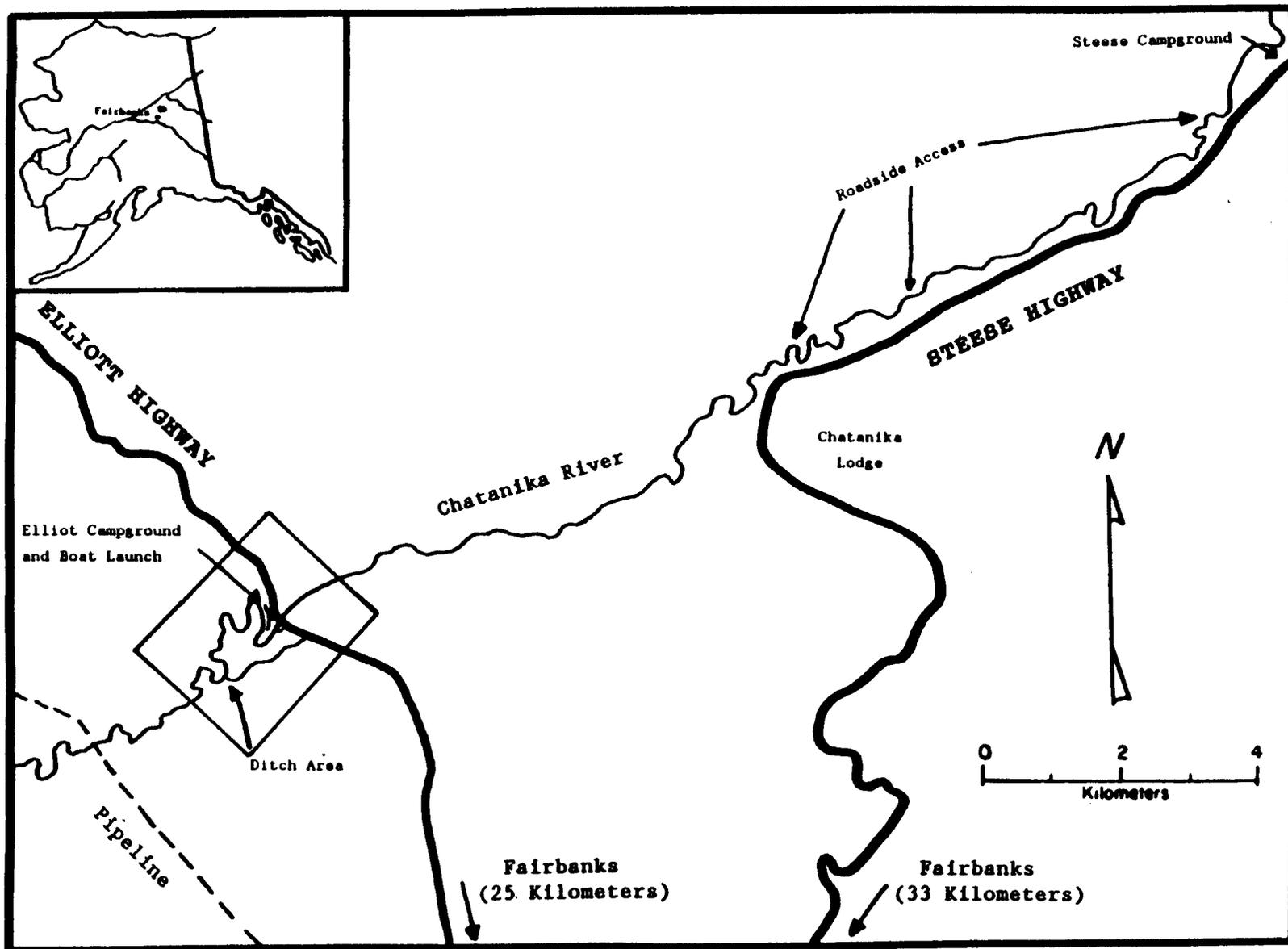


Figure 3. Location of Chatanika River Arctic grayling fishery, and whitefish spear fishery, Tanana River drainage, Alaska.

used spinners as their terminal gear (80%) (Table 5). Also, 13% of the anglers were tourists and 3% were military.

The anglers interviewed were asked to rate the fishery and compare the fishery this current year to prior years. They gave the Chatanika River Arctic grayling fishery a 3.04 rating or "Fair" rating (Table 6). Of these, no anglers rated the fishery as excellent, 21% rated it as good, 54% rated it as fair, and 25% rated it as poor. Also, 83% of anglers had no opinion when comparing the fishery to prior years and the rest of the anglers interviewed said the fishery was either the same (10%) or worse (7%).

Table 4. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of Arctic grayling at the Chatanika River Arctic grayling fishery, 1987.

Strata	Angler Interviews		CPUE		HPUE	
	C <sup>1</sup>	I <sup>2</sup>	Mean	SE	Mean	SE
May 18 - May 30						
Weekdays (0800-2200)	4	0	0.00	0.00	0.00	0.00
Weekends (0800-2200)	3	0	0.00	0.00	0.00	0.00
Jun 1 - Jun 30						
Weekdays (0800-2200)	1	13	0.72	0.25	0.07	0.09
Weekends (0800-2200)	3	6	0.11	0.11	0.00	0.00
May 18 - Jun 30	11	19	0.21	0.14	0.02	0.04

<sup>1</sup> Number of complete trip angler interviews.

<sup>2</sup> Number of incomplete trip angler interviews.

Table 5. Demographic profile of anglers interviewed at the Chatanika River Arctic grayling fishery, 1987.

Angler				Angler			
Characteristic	n	%	SE	Characteristic	n	%	SE
Total Number of Interviews	30	—	—	Local	24	80%	7.3%
				Non-local	6	20%	7.3%
Male	25	83%	6.9%	Tourist	4	13%	6.1%
Female	5	17%	6.9%	Military	1	3%	3.0%
				Neither	25	83%	6.9%
Adult	26	87%	6.1%	Gear Types:			
Youth	4	13%	6.1%	Spinners	24	80%	7.3%
Resident	24	80%	7.3%	Bait	1	3%	3.0%
Non-resident	6	20%	7.3%	Flies	5	17%	6.9%

Table 6. Opinions of anglers interviewed at the Chatanika River Arctic grayling fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	0	0%	—
	Good (2)	6	21%	7.7%
	Fair (3)	15	54%	9.4%
	Poor (4)	7	25%	8.2%
	Total	28		
	Mean Rating = 3.04			
2. How does the quality of grayling fishing compare to prior years?	Better	0	0%	—
	Same	3	10%	5.5%
	Worse	2	7%	4.7%
	No Answer	25	83%	6.7%
	Total	30		

## CHAPTER 2 - CHATANIKA RIVER WHITEFISH SPEAR FISHERY

### Introduction

The Chatanika River supports a large fall spawning run of least cisco, humpback whitefish, and round whitefish. Because of its proximity to Fairbanks (Figure 3) and the large size of this spawning run, a fall whitefish spear fishery has developed at the Chatanika River. This fishery accounts for about 70% of the whitefish harvest in the Tanana River drainage (Table 7) (Mills 1979-1987). The spear fishery begins in early September and ends when the river freezes up in mid to late October.

The whitefish spear fishery in the Tanana Drainage began in 1969. Historically, whitefish were pursued by recreational anglers with conventional rod and reel. However, because of the difficulty of catching whitefish on rod and reel, these users began to seek other means of harvesting whitefish. The result was the establishment of a spear fishing season for whitefish within the Tanana Drainage.

Most of the whitefish harvested during the Chatanika River spear fishery are least cisco and humpback whitefish. A few round whitefish are harvested along with incidental spearing of sheefish *Stenodus leucichthys*, Arctic grayling, and longnose suckers *Catostomus catastomus*. There is no bag limit for whitefish in this fishery. HPUE has averaged about 2 to 3 whitefish per hour since 1972 (Hallberg 1985). HPUE was 5 least cisco and 0.76 humpback whitefish per hour in 1986 (Clark and Ridder 1987). In 1986, the estimated harvest of whitefish was 19,686 fish, with estimated exploitation rates of 23% and 17% for least cisco and humpback whitefish, respectively (Clark and Ridder 1987; Hallberg and Holmes 1987).

The spear fishery on the Chatanika River developed rather slowly. A creel census in 1970 estimated a harvest of 400 whitefish (Table 7) (Hallberg 1985). Estimates of harvest from 1972-1980 averaged around 2,000 whitefish. However, since 1977 harvest of whitefish has increased at an average annual rate of 34%, making it the fastest growing recreational fishery in the Tanana Drainage (Table 7).

Concern over this rapidly expanding fishery and potential effects on stock status of whitefish prompted Sport Fish Division, Alaska Department of Fish and Game to initiate an indepth research project in 1986. The goal of this research is to estimate population abundance, harvest levels, species composition of the runs, and exploitation rates of whitefish in the spear fishery. Part of this research is a creel census that not only provides information on angler effort, harvest, and HPUE; but also provides biological data on mean fork length at age, sex ratios, and age composition of the harvest. The creel census portion of this project is presented below.

### Methods

The majority of the creel census is conducted in a state campground and boat launch area where the Elliott Highway bridge crosses the Chatanika River (Figure 3). Most anglers enter and exit the fishery from two locations within

Table 7. Estimated annual harvest of whitefish obtained from the Statewide Harvest Survey and on-site creel census of the fall Chatanika River whitefish spear fishery, 1977-1987.

Year	Chatanika River		Tanana Drainage <sup>1</sup>	Statewide <sup>1</sup>
	Postal Survey <sup>1</sup>	On-Site Creel Census		
1977	1,635	986	3,378	6,748
1978	6,013	5,517	6,573	11,731
1979	3,021	2,183	5,159	9,666
1980	3,340	1,587	5,958	11,464
1981	3,185	—	4,873	9,251
1982	6,640	—	8,643	15,433
1983	5,895	—	8,311	16,872
1984	9,268	5,758	11,658	16,719
1985	14,350	4,561	20,230	30,337
1986	22,038	19,105	26,810	39,718
1987	—	28,312	—	—

<sup>1</sup> From Mills (1978-1987).

this area and the major portion of the fishery is confined to a 1 mile long section of the river near this site. There is a small amount of additional angler effort that is expended above the Elliott Highway bridge and where the Chatanika River is accessible from the Steese Highway (Figure 3). The majority of the fishing is from shore, although there is a small amount of effort from boat anglers.

The Chatanika River whitefish spear fishery occurs primarily in the evenings from 2000 to 0200 hours. The sample period for the fishery is 6 hours. Weekend and weekday strata are used in the sample design. Sampling effort is allocated equally to the weekend and weekday strata.

The Chatanika River whitefish creel census is a harvest survey and is conducted during the months of September and October. A total of 12 sample periods are collected each month. One angler count is conducted at a randomly selected time in each hour of the sample period. All anglers leaving the fishery are interviewed. Most of the anglers interviewed have completed their fishing trip.

The field sampling procedure is as follows. A count of all anglers is made by visiting three viewing locations (Figure 3). The entire count takes about 15 minutes to complete. The remainder of each hour is devoted to angler interviews. The creel clerk spends approximately 20 to 25 minutes of each hour at each of the two major exit locations (Figure 3).

### Results and Discussion

#### Harvest and HPUE Estimates:

The Chatanika River harvest survey began on 11 September and continued through 18 October 1987. During this time, 68 angler counts were conducted and 234 anglers interviewed, of which 189 were from complete trips and 45 were from incomplete trips (Table 8). Estimated angler effort was 3,849 hours (Table 8). HPUE and harvest estimates for the least cisco were 4.14 fish per hour and 15,931 fish harvested (Table 8). From 25 September through 1 October 1987, 76% of the least cisco were harvested and HPUE peaked at about 7 fish per hour. Estimated HPUE for humpback whitefish was 0.80 fish per hour. An estimated 3,072 humpback whitefish were harvested (Table 9). Harvest for the humpback whitefish was much more spread out over time than the least cisco harvest (Tables 8 and 9). Only 187 round whitefish were harvested. The estimated HPUE was 0.05 round whitefish per hour (Table 10).

#### Expanded Harvest Estimates:

During the middle of the creel census, it was discovered that there was spear fishing occurring outside the Elliott campground area in the ditch area (Figure 3). Because of this, the creel census was expanded to estimate harvest in the ditch area. Because of the difficulty of conducting angler counts in the ditch area, another means of expanding the harvest was developed. The number of cars and the number of people per car were counted in each area for the remainder of the fishery.

Twenty car counts were made with 24.7 ( $s^2 = 23.16$ ) and 12.1 ( $s^2 = 14.84$ ) cars on average found in the campground and ditch areas, respectively. The number of people per car in the two areas was determined by asking individual anglers how many people were in the car they arrived in. Thirty-four anglers were interviewed in the ditch area and 30 anglers in the campground area. The mean number of people per car was estimated at 2.1 and 2.5 for the campground and ditch areas, respectively. However, the number of people per car was tested for differences between areas using a Mann-Whitney-Wilcoxin Test (Cochran 1977). The number of people per car between areas was not significant ( $Z = -0.8791$  with  $p = 0.3793$ ). Therefore, the number of people per car was assumed to be the same for the two areas.

From this, the ratio of the cars between the two area becomes a direct indicator of harvest if the following assumptions are made:

- 1) HPUE is the same between the two areas (there was no HPUE information from the ditch area); and
- 2) the ratio of the number of people (cars) between the two areas was the same prior the car counts.

With these assumptions, the harvest estimate was expanded as follows:

$$(19) \quad R = \frac{\bar{C}_D}{\bar{C}_E},$$

and,

$$(20) \quad H_D = RH_E,$$

where:

$\bar{C}_D$  = mean number of cars at the ditch area,

$\bar{C}_E$  = mean number of cars at the Elliott Highway campground and boat launch area,

$R$  = ratio of the mean number of cars in the two area, and,

$H_E$  = harvest estimate in Elliott Highway campground and boat launch area from creel census.

The variance of  $H_D$  is estimated by

$$(21) \quad \hat{V}[R] = R^2 \left[ \frac{\hat{V}[\bar{C}_D]}{\bar{C}_D^2} + \frac{\hat{V}[\bar{C}_E]}{\bar{C}_E^2} \right],$$

and,

$$(22) \quad \hat{V}[H_D] = \hat{V}[R]H_E^2 + \hat{V}[H_E]R^2 - \hat{V}[R]\hat{V}[H_E],$$

where:

$$\begin{aligned} \hat{V}[R] &= \text{variance of the ratio of mean number cars per area,} \\ \hat{V}[C_D] &= \text{variance of mean number of cars at the ditch area,} \\ \hat{V}[C_E] &= \text{variance of the mean number of cars at the Elliott} \\ &\quad \text{Highway campground and boat launch area, and,} \\ \hat{V}[H_E] &= \text{variance of the creel census harvest as calculated} \\ &\quad \text{using equation (18).} \end{aligned}$$

The harvest estimate in the ditch area was 7,804 least cisco, 1,505 humpback whitefish, and 92 round whitefish (Table 11). Adding these to the Elliott Highway harvest estimate, the expanded harvest becomes 23,735 least cisco, 4,577 humpback whitefish, and 279 round whitefish. These expansions increased the original harvest estimates by about 33% for all three species. Therefore, the estimated total harvest for the three whitefish species was 28,591.

#### Distribution of Angler Harvest, Biological Data, and Demographic Profiles:

Based upon 162 angler interviews and a harvest sample of 1,555 whitefish, the distribution of whitefish harvest shows that 82% of anglers harvested 15 or fewer fish and accounted for only 30% of the harvest (Table 12). Of the 82% who harvested 15 or fewer whitefish, 23% harvested no whitefish.

Biological data were collected from 604 least cisco and 686 humpback whitefish harvested during the Chatanika River harvest survey. Age at harvest ranged from 2 to 8 years for least cisco with age 4 accounting for about 39% of the harvest (Table 13). Age at harvest for humpback whitefish ranged from 3 to 10 years with age 5 accounting for 35% of the harvest. Mean length at age for least cisco and humpback whitefish were calculated for both males and females (Table 14). Mean length was 321 mm for all least cisco and 391 mm for all humpback whitefish. For both species, the females were bigger than the males.

Anglers utilizing the Chatanika River whitefish fishery were primarily males (86%), adults (93%), residents of the State of Alaska (100%), and resident of the Fairbanks area (100%) (Table 15). Military and tourists only accounted for 6% and 1% of the anglers interviewed, respectively. All of the anglers interviewed used spears to harvest the whitefish.

Table 8. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of least cisco at the Chatanika River whitefish spear fishery, 1987.

Strata	Angler Effort		Angler Interviews			HPUE		Harvest	
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Total	SE
Sep 11 - Sep 13	7	70	32	2	12	0.00	0.00	0	0
Sep 14 - Sep 17	3	72	59	10	0	0.10	0.10	7	7
Sep 18 - Sep 20	6	165	96	13	10	0.36	0.10	60	37
Sep 21 - Sep 24	6	220	143	22	0	1.09	0.63	239	159
Sep 25 - Sep 27	10	862	203	44	0	7.29	1.45	6,288	1,919
Sep 28 - Oct 1	5	835	425	16	7	7.04	1.24	5,879	3,120
Oct 2 - Oct 4	6	639	216	22	3	3.95	0.78	2,522	973
Oct 5 - Oct 8	5	538	307	13	4	1.6	0.57	860	552
Oct 9 - Oct 11	9	204	113	21	8	0.37	0.15	76	49
Oct 12 - Oct 14	5	211	124	18	0	0.00	0.00	0	0
Oct 15 - Oct 18	6	33	22	8	1	0.00	0.00	0	0
Jun 15 - Aug 31	68	3,849	279	189	45	4.14	0.98	15,931	3,834

<sup>1</sup> Number of instantaneous hourly angler counts.

<sup>2</sup> Number of completed trip angler interviews.

<sup>3</sup> Number of incompleted trip angler interviews.

Table 9. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of humpback whitefish at the Chatanika River whitefish spear fishery, 1987.

Strata	Angler Effort		Angler Interviews		HPUE		Harvest		
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Total	SE
Sep 11 - Sep 13	7	70	32	2	12	1.06	0.25	74	37
Sep 14 - Sep 17	3	72	59	10	0	0.21	0.13	15	13
Sep 18 - Sep 20	6	165	96	13	10	0.81	0.21	133	83
Sep 21 - Sep 24	6	220	143	22	0	0.39	0.14	85	60
Sep 25 - Sep 27	10	862	203	44	0	0.92	0.22	796	265
Sep 28 - Oct 1	5	835	425	16	7	0.41	0.16	344	208
Oct 2 - Oct 4	6	639	216	22	3	1.11	0.24	708	280
Oct 5 - Oct 8	5	538	307	13	4	1.34	0.58	722	485
Oct 9 - Oct 11	9	204	113	21	8	0.84	0.21	172	101
Oct 12 - Oct 14	5	211	124	18	0	0.08	0.06	18	14
Oct 15 - Oct 18	6	33	22	8	1	0.16	0.13	5	5
Jun 15 - Aug 31	68	3,849	279	189	45	0.80	0.28	3,072	670

- <sup>1</sup> Number of instantaneous hourly angler counts.  
<sup>2</sup> Number of completed trip angler interviews.  
<sup>3</sup> Number of incompleted trip angler interviews.

Table 10. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of round whitefish at the Chatanika River whitefish spear fishery, 1987.

Strata	Angler Effort		Angler Interviews		HPUE		Harvest		
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Total	SE
Sep 11 - Sep 13	7	70	32	2	12	0.19	0.14	13	11
Sep 14 - Sep 17	3	72	59	10	0	0.00	0.00	0	0
Sep 18 - Sep 20	6	165	96	13	10	0.39	0.18	64	45
Sep 21 - Sep 24	6	220	143	22	0	0.19	0.07	43	30
Sep 25 - Sep 27	10	862	203	44	0	0.01	0.01	10	10
Sep 28 - Oct 1	5	835	425	16	7	0.00	0.00	0	0
Oct 2 - Oct 4	6	639	216	22	3	0.01	0.01	9	8
Oct 5 - Oct 8	5	538	307	13	4	0.03	0.03	15	15
Oct 9 - Oct 11	9	204	113	21	8	0.07	0.05	15	12
Oct 12 - Oct 14	5	211	124	18	0	0.08	0.06	18	14
Oct 15 - Oct 18	6	33	22	8	1	0.00	0.00	0	0
Jun 15 - Aug 31	68	3,849	279	189	45	0.05	0.05	187	61

- <sup>1</sup> Number of instantaneous hourly angler counts.  
<sup>2</sup> Number of completed trip angler interviews.  
<sup>3</sup> Number of incompleted trip angler interviews.

Table 11. Estimates of harvest and expanded harvest at the Elliott Highway campground/boat launch area, and ditch area for least cisco, humpback whitefish, round whitefish, and Arctic grayling from the Chatanika River whitefish harvest survey, 1987.

Species	Elliott Harvest <sup>1</sup>	SE	Ditch Harvest <sup>2</sup>	SE	Expanded Harvest <sup>3</sup>	SE
Least Cisco	15,931	3,834	7,804	3,395	23,735	5,121
Humpback Whitefish	3,072	670	1,505	639	4,577	926
Round Whitefish	187	61	92	44	279	75
Arctic Grayling	155	46	76	35	231	58

<sup>1</sup> Elliott harvest estimate is the harvest survey estimate for the campground and boat launch area.

<sup>2</sup> Ditch Harvest is a direct expansion of the Elliott harvest estimate based upon the ratio of cars at the Elliott and Ditch areas.

<sup>3</sup> Expanded harvest estimate is the Elliott and Ditch harvest estimates combined.

Table 12. Distribution of whitefish<sup>1</sup> harvest among anglers interviewed at the Chatanika River whitefish spear fishery, 1987.

Number of Fish	Anglers				Harvest			
	n	%	Cumm	%	n	%	Cumm	%
0	37	23%	37	23%	0	0%	0	0%
1	23	14%	60	37%	23	1%	23	1%
2	19	12%	79	49%	38	4%	61	4%
3	5	3%	84	52%	15	5%	76	5%
4	13	8%	97	60%	52	8%	128	8%
5	5	3%	102	63%	25	10%	153	10%
6	1	1%	103	64%	6	10%	159	10%
7	6	4%	109	67%	42	13%	201	13%
8	5	3%	114	70%	40	15%	241	15%
9	2	1%	116	72%	18	17%	259	17%
10	4	2%	120	74%	40	19%	299	19%
11	1	1%	121	75%	11	20%	310	20%
12	5	3%	126	78%	60	24%	370	24%
13	2	1%	128	79%	26	25%	396	25%
14	3	2%	131	81%	42	28%	438	28%
15	2	1%	133	82%	30	30%	468	30%
16	2	1%	135	83%	32	32%	500	32%
18	1	1%	136	84%	18	33%	518	33%
20	1	1%	137	85%	20	35%	538	35%
23	1	1%	138	85%	23	36%	561	36%
25	2	1%	140	86%	50	39%	611	39%
26	1	1%	141	87%	26	41%	637	41%
27	2	1%	143	88%	54	44%	691	44%
28	1	1%	144	89%	28	46%	719	46%
31	1	1%	145	90%	31	48%	750	48%
32	3	2%	148	91%	96	54%	846	54%
33	2	1%	150	93%	66	59%	912	59%
36	1	1%	151	93%	36	61%	948	61%
37	2	1%	153	94%	74	66%	1022	66%
41	1	1%	154	95%	41	68%	1063	68%
42	1	1%	155	96%	42	71%	1105	71%
43	1	1%	156	96%	43	74%	1148	74%
46	1	1%	157	97%	46	77%	1194	77%
58	1	1%	158	98%	58	81%	1252	81%
60	1	1%	159	98%	60	84%	1312	84%
62	1	1%	160	99%	62	88%	1374	88%
86	1	1%	161	99%	86	94%	1460	94%
95	1	1%	162	100%	95	100%	1555	100%
Total	162				1555			

<sup>1</sup> Includes least cisco, humpback whitefish, and round whitefish combined.

Table 13. Estimated age composition by sex of least cisco and humpback whitefish in the harvest sample from the Chatanika River whitefish spear fishery, 1987.

Age	Males			Females			All		
	n	%	SE	n	%	SE	n	%	SE
<u>Least Cisco</u>									
2	2	0.6%	0.4%	0	0.0%	—	2	0.3%	0.2%
3	86	25.2%	2.4%	20	9.2%	2.0%	110	18.2%	1.6%
4	156	45.7%	2.7%	64	29.4%	3.1%	238	39.4%	2.0%
5	70	20.5%	2.2%	71	32.6%	3.2%	162	26.8%	1.8%
6	19	5.6%	1.2%	49	22.5%	2.8%	73	12.1%	1.3%
7	6	1.8%	0.7%	8	3.7%	1.3%	14	2.3%	0.6%
8	2	0.6%	0.4%	6	2.8%	1.1%	5	0.8%	0.4%
Total	341			218			604		
<u>Humpback Whitefish</u>									
3	10	3.3%	1.0%	6	2.9%	1.2%	19	2.8%	0.6%
4	95	31.1%	2.7%	49	23.9%	3.0%	199	29.0%	1.7%
5	118	38.7%	2.8%	64	31.2%	3.2%	245	35.7%	1.8%
6	56	18.4%	2.2%	54	26.3%	3.1%	138	20.1%	1.5%
7	20	6.6%	1.4%	17	8.3%	1.9%	54	7.9%	1.0%
8	2	0.7%	0.5%	9	4.4%	1.4%	18	2.6%	0.6%
9	3	1.0%	0.6%	4	2.0%	1.0%	10	1.5%	0.5%
10	1	0.3%	—	2	1.0%	0.7%	3	0.4%	0.3%
Total	305			205			686		

Table 14. Mean fork length (mm) at age of least cisco and humpback whitefish in the harvest sample from the Chatanika River whitefish spear fishery, 1987.

Age	Males			Females			All		
	n	Mean	SE	n	Mean	SE	n	Mean	SE
<u>Least Cisco</u>									
2	2	254	12.0	0	—	—	2	254	12.0
3	86	302	1.1	20	310	2.5	110	303	1.1
4	156	313	0.7	64	315	1.9	238	314	0.7
5	70	326	0.9	71	330	1.1	162	328	0.7
6	19	349	2.8	49	344	1.4	73	345	1.4
7	6	370	5.1	8	379	4.1	14	375	3.3
8	2	415	5.0	3	390	5.8	5	400	7.1
Total	341	316	1.0	215	330	1.4	604	321	0.8
<u>Humpback Whitefish</u>									
3	10	348	4.3	6	350	9.2	19	345	4.7
4	95	365	1.5	49	371	2.2	199	368	0.9
5	118	386	1.4	64	387	1.7	245	386	0.9
6	56	410	1.7	54	410	2.0	138	409	1.1
7	20	428	4.4	17	425	3.2	54	427	2.5
8	2	445	5.5	9	456	5.5	18	452	4.0
9	3	473	8.6	4	465	13.1	10	469	5.6
10	1	492	—	2	478	15.2	3	497	2.7
Total	305	387	1.6	205	397	2.1	686	391	1.1

Table 15. Demographic profile of anglers interviewed at the Chatanika River whitefish spear fishery, 1987.

Angler				Angler			
Characteristic	n	%	SE	Characteristic	n	%	SE
Total Number of Interviews	252	—	—	Local	238	100%	—
				Non-local	0	0%	—
Male	217	86%	2.2%	Tourist	3	1%	0.6%
Female	35	14%	2.2%	Military	15	6%	1.5%
				Neither	234	93%	1.6%
Adult	225	93%	1.6				
Youth	17	7%	1.6%	Gear Types:			
				Spears	252	100%	—
Resident	238	100%	—				
Non-resident	0	0%	—				

## CHAPTER 3 - CHENA RIVER ARCTIC GRAYLING FISHERY

### Introduction

The largest Arctic grayling fishery in Alaska occurs at the upper Chena River. This fishery attracts a large number of anglers because of its close proximity to Fairbanks and because the majority of the fishery is accessible by road (Figure 4). Some type of creel census has been conducted at the upper Chena River almost every year since 1970 (Holmes 1985). Angler effort has ranged from 22,657 angler-hours in 1975 to a low of 9,090 angler-hours in 1987 (Table 16). Both harvest (18,049) and HPUE (1.55 Arctic grayling per hour) peaked in 1974.

Since 1981, both harvest and HPUE of Arctic grayling have declined (Table 16). The mean length of harvested Arctic grayling for the past 10 years has been 246 mm and the proportion of "quality" grayling (> 300 mm) has ranged from 10% to 30%. The relatively small mean length and decreased abundance of grayling are commonly commented on by anglers. For these reasons, a series of fishery management regulations have been implemented at the upper Chena River grayling fishery that includes:

- 1) a 12 inch minimum length limit for Arctic grayling;
- 2) a no-bait restriction on the upper Chena River; and
- 3) catch and release Arctic grayling fishing from 1 April to the first Saturday of June each year at the upper Chena River.

These regulations were put into effect in 1987 to help sustain the declining Arctic grayling stock(s) of the upper Chena River and still provide angling opportunity. There are indications the management regulations are working. Although harvest and HPUE have declined since 1981, catch and CPUE increased from 1986 to 1987 (Table 16). Catch and CPUE were not estimated before 1986.

### Methods

The upper Chena River grayling fishery occurs along a 43.3 kilometer section of the Chena Hot Springs Road that parallels the Chena River (Figure 4). Numerous access points are available to anglers including eight bridges, three state campsites, and four side access roads. Approximately, 90 percent of the angler effort occurs from shore near these access sites (Holmes 1981). A small proportion of anglers reach the more remote areas by floating between the access points.

The Chena River Arctic grayling creel census is a roving creel census that was conducted from 18 May through 15 September in 1987. Holmes (1981) found that 83% of the fishing effort occurs between 0800 and 2200 hours on the upper Chena River. For this reason, the angling day is considered to be 14 hours long. Each month is divided into four time strata: (1) weekdays 1100 to 1900 hours; (2) weekdays 0800 to 1100 hours, and 1900 to 2200 hours; (3) weekends and holidays 1100 to 1900 hours; and (4) weekends and holidays 0800 to 1100 hours, and 1900 to 2200 hours. Optimal allocation indicates that 40%, 24%,

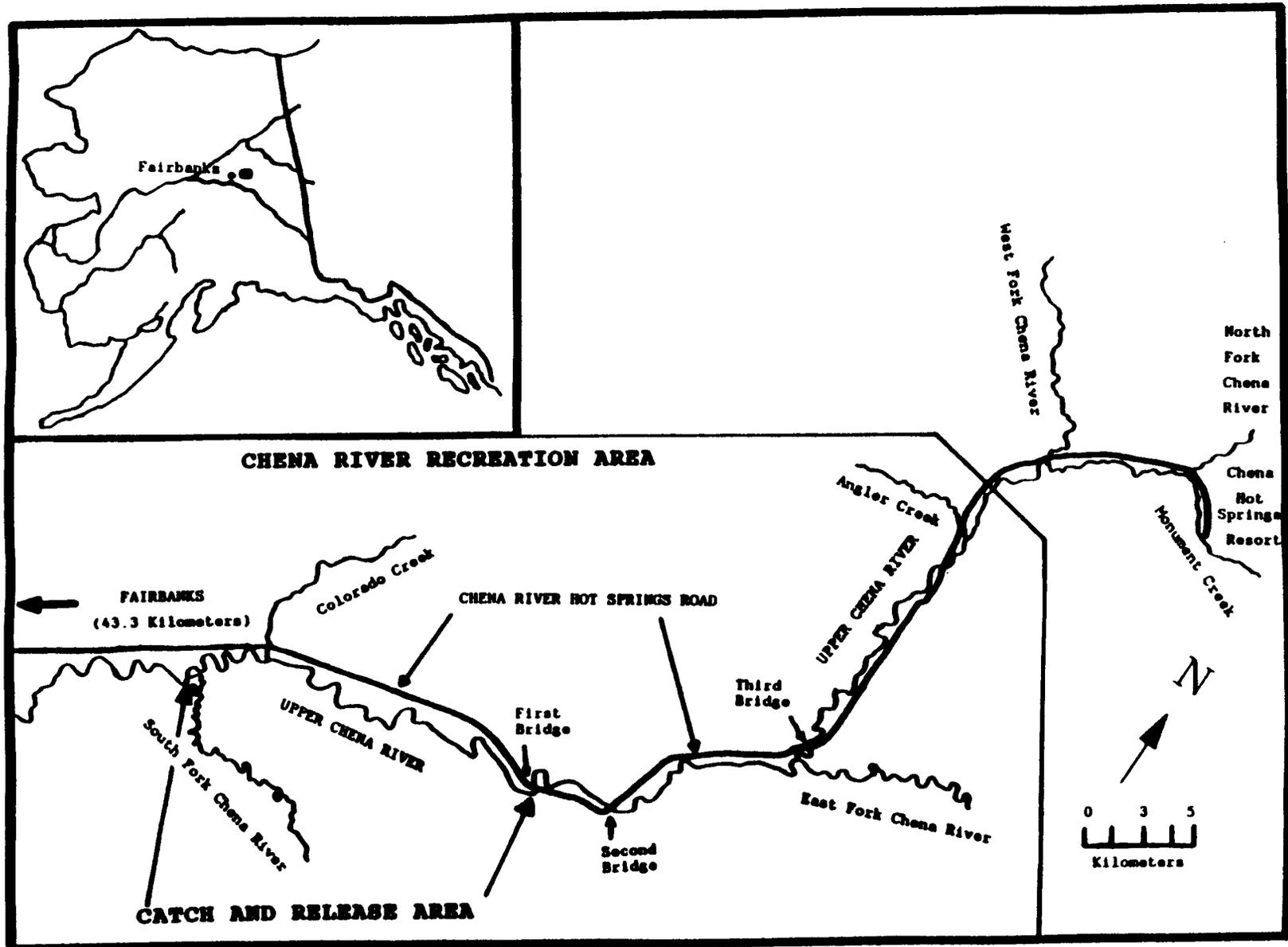


Figure 4. Location of the upper Chena River Arctic grayling fishery and lower Chena River chinook and chum salmon fishery, Tanana River drainage, Alaska.

Table 16. Summary of creel census results for the upper Chena River Arctic grayling fishery, 1970-1987.

Year <sup>1</sup>	Date	Days	Angler Effort <sup>2</sup>	HPUE <sup>3</sup>	CPUE <sup>4</sup>	Harvest	Catch
1970	May 1 - May 31	78	12,518	0.54	—	6,770	—
	Jul 14 - Aug 29						
1972	May 25 - Aug 27	95	13,116	0.77	—	10,099	—
1974	Jul 1 - Aug 31	62	11,680	1.55	—	18,049	—
1975 <sup>5</sup>	Jun 1 - Aug 31	92	22,657	0.62	—	14,067	—
1976	Jun 1 - Aug 31	92	10,752	0.39	—	4,161	—
1977	Jun 1 - Aug 31	92	13,536	0.69	—	9,406	—
1978	May 29 - Aug 31	95	10,508	0.65	—	6,898	—
1979	Jun 1 - Aug 31	92	12,744	0.82	—	10,459	—
1980	May 8 - Sep 30	144	20,827	0.78	—	16,390	—
1981	May 1 - Aug 31	123	15,896	0.80	—	13,549	—
1982	May 1 - Sep 15	138	20,379	0.62	—	12,603	—
1983	May 1 - Sep 15	138	19,018	0.58	—	10,821	—
1984	May 6 - Sep 15	132	17,090	0.59	—	9,623	—
1985	May 8 - Sep 5	121	10,613	0.22	—	2,335	—
1986	May 1 - Sep 15	138	10,716	0.31	0.48	3,326	5,148
1987 <sup>6</sup>	May 18 - Sep 15	121	9,090	0.14	0.78	1,260	6,997

<sup>1</sup> Data prior to 1982 from Hallberg (1982).

<sup>2</sup> Number of angler-hours.

<sup>3</sup> Number of Arctic grayling caught and kept per hour.

<sup>4</sup> Number of Arctic grayling caught per hour.

<sup>5</sup> Daily bag limit for Arctic grayling was reduced from 10 fish to 5 fish.

<sup>6</sup> Management regulations were initiated prior to this fishing season that included: (1) Catch and release Arctic grayling from 1 April to the first Saturday in June; (2) A 12 inch minimum length limit; and (3) A no-bait restriction (flies and lures only).

26%, and 10% of monthly sampling effort should be expended in strata 1, 2, 3, and 4, respectively.

Twenty angler count/interview samples are collected each month. These samples are distributed among the four strata as described above. The sample period for the upper Chena River creel census is 2 hours. The field procedure during the sample period is as follows. At the start of a selected 2 hour time period, a coin is tossed to determine if an angler count or angler interviews will be conducted first. Angler counts are made by driving the main road and all side roads on which anglers are located within the 43.3 kilometer section. Angler counts take an average of 40 minutes to complete. The remainder of the sample period is spent conducting angler interviews. Most angler interviews are from incomplete trips.

### Results and Discussion

The upper Chena River Arctic grayling creel began on 18 May and continued through 15 September 1987. During this time, 101 angler counts were conducted along with 368 angler interviews. Of the angler interviews, 317 (86%) were incomplete trip interviews and 51 (24%) were completed trip interviews. Angler effort was estimated to be 9,090 angler-hours (Table 17). The months of June (6 June to 30 June) and July accounted for 33% and 42% of the total angler effort, respectively. CPUE ranged from a low of 0.32 grayling per hour to a high of 1.55 grayling per hour. CPUE for the entire creel census was 0.31 grayling caught per hour. HPUE peaked in September with 0.37 grayling being caught and kept per hour. HPUE was 0.14 grayling per hour. The total Arctic grayling catch and harvest was estimated to be 6,997 and 1,260, respectively. Angler effort during the month of July accounted for 47% of the harvest and 58% of the catch. Distribution of Arctic grayling catch and harvest shows that anglers interviewed who caught five or fewer grayling accounted for 40% of the catch and 100% of the harvest (Table 18).

Biological data were collected from 68 Arctic grayling examined during the upper Chena River fishery. Age at harvest ranged from 3 to 10 years (Table 19). Four strong age classes were almost evenly distributed in the harvest with ages 4, 5, 6, and 7 accounting for 24%, 18%, 16%, and 20% of the harvest, respectively. Mean fork length for the entire harvest sample was 290 mm which is approximately equal to the mean length of age 5 grayling. Quality size grayling made up 68% of the harvest, with the rest of the harvest being divided between stock size (22%) and preferred size (10%).

The majority of the anglers utilizing the upper Chena River Arctic grayling fishery were male (79%), adult (80%), residents of the State of Alaska (84%), and live near Fairbanks (79%) (Table 20). Military personnel and tourists made up 9% and 16% of the anglers utilizing the upper Chena River, respectively. Fifty-four percent of the anglers utilized spinners as their terminal fishing gear.

Anglers gave the upper Chena River Arctic grayling fishery a mean rating of 2.91, which is approximately a "fair" rating (Table 21). Of these anglers, 32% rated the fishery as either excellent or good and 68% rated the fishery either as fair or poor. The majority of the anglers interviewed approved of a

12 inch minimum length limit (73%), a no-bait restriction (70%), catch and release grayling fishing until June (64%), and a catch and release section for the upper Chena River (62%) (Table 21).

Table 17. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of Arctic grayling at the upper Chena River, 1987.

Strata	Angler													
	Angler Effort			Interviews		CPUE		HPUE		Catch		Harvest		
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Mean	SE	Total	SE	Total	SE	
May 18 - Jun 5	16	699	395	4	22	1.55	0.59	0.00	0.00	1,081	1,345	0	0	
Jun 6 - Jun 30	23	2,986	466	22	107	0.67	0.31	0.10	0.07	2,002	787	301	133	
Jul 1 - Jul 31	25	3,815	454	17	121	0.87	0.36	0.19	0.09	3,311	1,033	737	263	
Aug 1 - Aug 31	26	1,153	286	6	55	0.32	0.18	0.09	0.09	373	287	104	81	
Sep 1 - Sep 15	11	437	176	2	12	0.72	0.34	0.37	0.17	229	224	117	124	
May 18 - Sep 15	101	9,090	821	51	317	0.78	0.35	0.14	0.09	6,997	1,907	1,260	330	

- <sup>1</sup> Number of instantaneous hourly angler counts.  
<sup>2</sup> Number of completed trip angler interviews.  
<sup>3</sup> Number of incompleted trip angler interviews.

Table 18. Distribution of Arctic grayling catch and harvest among anglers interviewed at the upper Chena River Arctic grayling fishery, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	15	30%	30%	0	0%	0%	33	66%	66%	0	0%	0%
1	6	12%	42%	6	4%	4%	5	10%	76%	5	12%	12%
2	8	16%	58%	16	10%	14%	6	12%	88%	12	29%	41%
3	1	2%	60%	3	2%	16%	2	4%	92%	6	15%	56%
4	3	6%	66%	12	8%	24%	2	4%	96%	8	20%	76%
5	5	10%	76%	25	16%	40%	2	4%	100%	10	24%	100%
6	4	8%	84%	24	15%	55%						
7	0	0%	84%	0	0%	55%						
8	5	10%	94%	40	26%	81%						
9	0	0%	94%	0	0%	81%						
10	3	6%	100%	30	19%	100%						
Total	50			156			50			41		

<sup>1</sup> Number of anglers interviewed (complete trip only) that caught or harvested a certain number of Arctic grayling.

<sup>2</sup> Number of Arctic grayling caught or harvested by that group of anglers.

Table 19. Estimates of the contributions of each age class, mean fork length (mm) at age, and relative stock density (RSD) of Arctic grayling in the harvest sample at the upper Chena River Arctic grayling fishery, 1987.

Age	Age Composition			Fork Length		Relative Stock Density				
	n	%	SE	Mean	SE	Category	Range <sup>1</sup>	n	%	SE
3	4	6%	2.9%	243	21	Stock	150-269	17	22%	4.7%
4	16	24%	5.2%	252	4	Quality	270-339	54	68%	5.3%
5	12	18%	4.4%	292	7	Preferred	340-449	8	10%	3.4%
6	11	16%	4.5%	298	6	Memorable	450-559	0	0%	—
7	20	29%	5.5%	313	6	Trophy	560-above	0	0%	—
8	3	4%	2.4%	333	24					
9	1	1%	1.2%	340	—					
10	1	1%	1.2%	395	—					
Total	68			290	6	Total		79		

<sup>1</sup> Range is the fork length range (mm) of each RSD category.

Table 20. Monthly demographic profiles of anglers interviewed at the upper Chena River Arctic grayling fishery, 1987.

Angler Characteristic	May <sup>1</sup>		June <sup>2</sup>		July		August <sup>3</sup>		Total	
	n	%	n	%	n	%	n	%	n	%
Total Number of Interviews	27	—	129	—	139	—	61	—	356	—
Male	24	92%	96	74%	107	78%	51	84%	278	79%
Female	2	8%	33	26%	31	22%	10	16%	76	21%
Adult	15	58%	109	84%	110	80%	47	77%	281	80%
Youth	11	42%	20	16%	27	20%	14	23%	72	20%
Resident	26	100%	112	87%	97	76%	44	90%	279	84%
Non-resident	0	0%	17	13%	31	24%	5	10%	53	16%
Local	26	100%	107	84%	86	68%	40	82%	259	79%
Non-local	0	0%	21	16%	40	32%	9	18%	70	21%
Tourist	1	4%	16	12%	29	21%	11	18%	57	16%
Military	3	11%	10	8%	13	9%	5	8%	31	9%
Neither	23	85%	103	80%	97	70%	45	74%	268	75%
Gear Types:										
Spinners	14	54%	57	44%	85	62%	33	54%	189	54%
Bait	0	0%	0	0%	0	0%	2	3%	2	1%
Jigs	8	31%	18	14%	6	4%	1	2%	33	9%
Flies	4	15%	54	42%	46	34%	25	41%	129	37%

<sup>1</sup> Anglers interviewed from May 18 thru June 5, 1987.

<sup>2</sup> Angler interviews from June 6 thru June 30, 1987.

<sup>3</sup> Angler interviews from August 1 thru September 15, 1987.

Table 21. Opinions of anglers interviewed at the upper Chena River Arctic grayling fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	12	3.5%	0.9%
	Good (2)	99	28.9%	2.5%
	Fair (3)	140	40.9%	2.5%
	Poor (4)	91	26.6%	2.4%
	Total	342		
	Mean Rating = 2.91			
2. What is your opinion of a 12 inch minimum length limit for Arctic grayling?	Approve	227	73.2%	2.5%
	Disapprove	40	12.9%	1.9%
	No Opinion	43	13.9%	2.0%
	Total	310		
3. What is your opinion of a no-bait restriction at the Upper Chena River?	Approve	216	69.7%	2.6%
	Disapprove	40	12.9%	1.9%
	No Opinion	54	17.4%	2.2%
	Total	310		
4. What is your opinion of catch and release Arctic grayling fishing until June 6th ?	Approve	199	64.2%	2.7%
	Disapprove	38	12.3%	1.9%
	No Opinion	73	23.5%	2.4%
	Total	310		
5. What is your opinion of catch and release only Arctic grayling fishing above the 2nd bridge at the Upper Chena River?	Approve	191	61.6%	2.8%
	Disapprove	47	15.2%	2.0%
	No Opinion	72	23.2%	2.4%
	Total	310		

## CHAPTER 4 - CHENA RIVER KING AND CHUM SALMON FISHERY

### Introduction

The lower 45 miles of the Chena River supports a chinook and chum salmon fishery (Figure 4). Public access to the fishery is available at several locations from Pike's Landing (River km 3.2) to the Chena River Park State Recreational Area (River km 67). Since 1978, 25 chinook salmon have been harvested annually with harvest increasing to 212 in 1986. Annual chum salmon harvest since 1978 has averaged about 16 (Mills 1979-1987).

In 1986, the area open to salmon fishing was lengthened to include about 25 additional river miles below the Chena Dam. A significant increase in fishing effort has resulted. For this reason, a creel preliminary creel census was conducted on the lower Chena River chinook and chum salmon fishery. The fishery generally begins in early July and ends in late July to early August. Regulations allow the harvest of one chinook salmon and three chum salmon per day. The primary goal of this creel census is to estimate CPUE, HPUE, and examine the chinook salmon harvest for tags (in conjunction with a Commercial Fish Division escapement estimation project).

### Methods

The lower Chena River chinook and chum salmon fishery occurs primarily at two road crossings (Nordale Road and Wendel Street), a State Recreational Area (Chena River Park), and on Fort Wainwright (Figure 4). There are boat launch facilities at the first three areas.

The fishery is stratified into (1) weekdays, excluding Friday, 0800 to 2200 hours, and (2) weekends/holidays and Friday, 0800 hours to 2200 hours. Each day is divided into 2 hour sample units.

Creel census is conducted in the month of July. Ten sample periods are randomly chosen for sampling during the month of July. Samples are allocated equally between the two strata. The lower Chena River salmon creel census is a roving CPUE survey.

The field sampling procedure is as follows. The creel clerk starts at the Wendel Street Bridge, interviewing all anglers in the area. The clerk continues on the Nordale Road Bridge and then out to Chena River Park. On the way back the clerk stops at Fort Wainwright. Creel clerks check all harvested chinook salmon for jaw tags (escapement estimation project, ADFG Commercial Fish Division). Angler interviews are split between complete and incomplete trips.

### Results and Discussion

The CPUE survey of the lower Chena River chinook and chum salmon fishery began on 1 July and continued through 28 July 1987. However, anglers were only interviewed from 11 July through 17 July 1987. Anglers were seen at other times outside of the 11 July through 17 July period while conducting other duties. However, no anglers were interviewed because it did not occur during a

scheduled CPUE sampling periods. Angler interviews totaled 42 with 1 complete trip and 41 incomplete trip (Table 22). CPUE and HPUE for chinook salmon were 0.022 and 0.009 chinook salmon per hour, respectively. CPUE of chinook salmon ranged from 0.000 to 0.0444 chinook salmon caught per hour and HPUE ranged from 0.000 to 0.017 chinook salmon harvested per hour. Both CPUE and HPUE for chum salmon were 0.000.

Anglers utilizing the lower Chena River chinook and chum salmon fishery were primarily males (90%), adults (88%), and used spinners as their terminal angling gear (94%) (Table 23). The fishery was split almost in half between military personnel (52%) and local Fairbanks residents (41%). Tourists accounted for 2% of the anglers interviewed.

The majority of the anglers interviewed were asked questions relating to management and quality of the lower Chena River chinook and chum salmon fishery. They gave the fishery a 3.08 rating with no anglers rating it excellent, 7 anglers rating it good (18%), 21 anglers rating it fair (55%), and 10 anglers rating it poor (26%) (Table 24). The majority of the anglers interviewed knew the bag limit (93%), and thought public boat access was adequate (75%). On the other hand, most of the anglers did not approve of reduced fishing seasons and emergency closures (52%). Finally, most anglers approved of the stocking of chinook salmon into the lower Chena River (78%).

Table 22. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of chinook and chum salmon at the lower Chena River chinook and chum salmon fishery, 1987.

Strata	Angler Interviews		CPUE		HPUE	
	C <sup>1</sup>	I <sup>2</sup>	Mean	SE	Mean	SE
<u>Chinook Salmon</u>						
Jul 11 - Jul 12 (Weekends)	0	2	0.000	0.000	0.000	0.000
Jul 13 - Jul 17 (Weekdays)	1	39	0.044	0.036	0.017	0.012
Jul 11 - Jul 17	1	41	0.022	0.026	0.009	0.009
<u>Chum Salmon</u>						
Jul 11 - Jul 12 (Weekends)	0	2	0.000	0.000	0.000	0.000
Jul 13 - Jul 17 (Weekdays)	1	39	0.000	0.000	0.000	0.000
Jul 11 - Jul 17	1	41	0.000	0.000	0.000	0.000

<sup>1</sup> Number of complete trip angler interviews.

<sup>2</sup> Number of incomplete trip angler interviews.

Table 23. Demographic profile of anglers interviewed at the lower Chena River chinook and chum salmon fishery, 1987.

Angler Characteristics				Angler Characteristics			
Characteristics	n	%	SE	Characteristics	n	%	SE
Total Number of Interviews	42	—	—	Local	17	85%	8.0%
				Non-local	3	15%	8.0%
Male	38	90%	4.6%	Tourist	3	7%	3.9%
Female	4	10%	4.6%	Military	22	52%	7.7%
				Neither	17	41%	7.6%
Adult	37	88%	5.0%				
Youth	5	12%	5.0%	Gear Types:			
				Spinners	38	94%	3.7%
Resident	17	85%	8.0%	Bait	1	2%	2.2%
Non-resident	3	15%	8.0%	Jigs	1	2%	2.2%
				Flies	1	2%	2.2%

Table 24. Opinions of anglers interviewed at the lower Chena River chinook and chum salmon fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	0	0%	—
	Good (2)	7	18%	6.2%
	Fair (3)	21	55%	8.1%
	Poor (4)	10	26%	7.1%
	Total	38		
	Mean Rating = 3.08			
2. Do you know the bag limit?	Yes	37	93%	4.0%
	No	3	7%	4.0%
	Total	40		
3. Is public boat access adequate?	Yes	30	75%	6.9%
	No	6	15%	5.7%
	No Opinion	4	10%	4.7%
	Total	40		
4. What is your opinion of reduced seasons and emergency closures of salmon fishing in the lower Chena River?	Approve	10	24%	6.6%
	Disapprove	22	52%	7.7%
	No Opinion	10	24%	6.6%
	Total	42		
5. What is your opinion of the stocking of chinook salmon in the lower Chena River?	Approve	33	78%	6.4%
	Disapprove	2	5%	3.4%
	No opinion	7	17%	5.8%
	Total	42		

## CHAPTER 5 - DELTA CLEARWATER RIVER GRAYLING FISHERY

### Introduction

The Delta Clearwater River provides a popular Arctic grayling sport fishery. The river is located approximately 8 miles northeast of Delta Junction (Figure 5). The main channel of the river is approximately 20 miles long. The river drains an area of about 1,000 square kilometers. Public access to the river is available at the State of Alaska Clearwater Campground at mile 8 of the river and at the U.S. Army facility on Clearwater Lake (Figure 5).

Fishing begins on the Delta Clearwater River in mid to late May when the larger Arctic grayling begin to migrate to their summer feeding areas in the upper part of the river. From 1978 to 1986, an average of 6,558 angler days were expended annually to harvest an average of 5,698 Arctic grayling (Mills 1979-1987). In 1986, angler effort peaked at 10,137 angler days. However, harvest dropped to it's lowest level (2,343) since 1977. Grayling have been stocked in the Delta Clearwater River since 1974 and these enhancement fish have provided as much as 31% of the total Delta Clearwater River Arctic grayling harvest (Ridder 1984). Even with the enhancement fish, there were indications the Arctic grayling stock(s) were declining. For this reason, emergency regulations were set forth on the Delta Clearwater River to protect the Arctic grayling stock(s) in 1987. These management regulations were as follows:

- 1) a 12 inch minimum length limit for Arctic grayling;
- 2) a no-bait restriction; and,
- 3) catch and release Arctic grayling fishing from 1 April to the first Saturday of June each year.

A creel census has been conducted at the Delta Clearwater Arctic grayling fishery since 1985. The long term goals of this creel census are to: (1) develop a historical database to allow the monitoring of both the recreational fishery and the exploited fish populations; (2) develop management regulations that reflect the desires of the angling public while ensuring the sustained health of the fish populations; and (3) evaluate the effect of management regulations and enhancement programs on the fishery.

### Methods

Public access to the Delta Clearwater River is available at the State of Alaska Clearwater Campground and at the U.S. Army camp on Clear Lake (Figure 5). Approximately 50% of the angling effort is from shore based anglers who fish within 1 mile of these access areas. The remainder of the effort is from anglers using river boats and cabin owners along the entire 20 miles of the river. Ridder (1982) found that approximately 98% of the fishing effort occurs on the 14 mile section of the mainstem Delta Clearwater River that is surveyed.

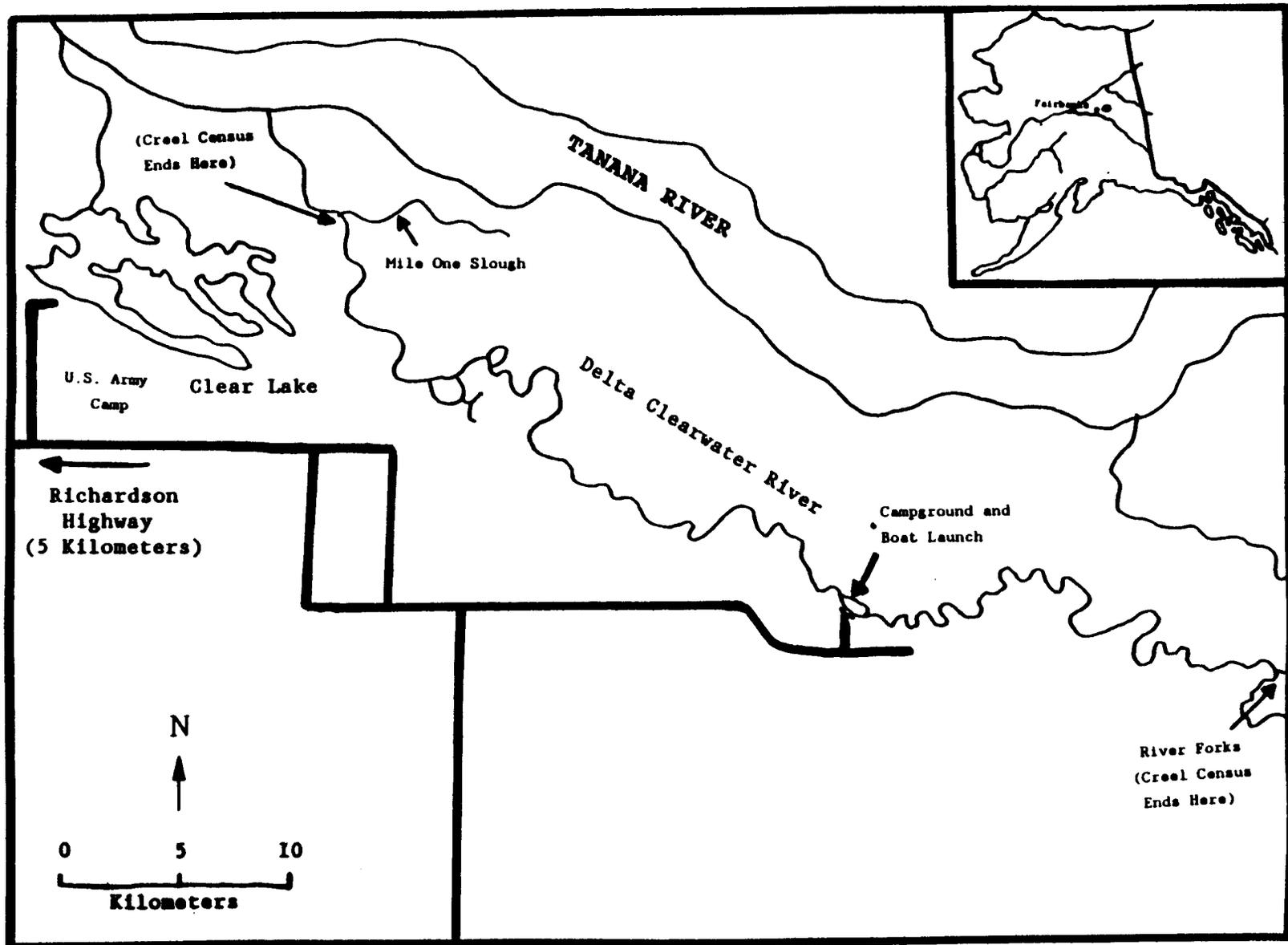


Figure 5. Location of the Delta Clearwater River Arctic grayling fishery, Tanana River drainage, Alaska

This creel census is a roving harvest survey. Fishing occurs on the Delta Clearwater River primarily between 0900 and 2100 hours. There are six monthly sampling strata: (1) weekdays 0900 to 1300 hours; (2) weekdays 1300 to 1700 hours; (3) weekdays 1700 to 2100 hours; (4) weekends and holidays 0900 to 1300 hours; (5) weekends and holidays 1300 to 1700 hours; (6) weekends and holidays 1700 to 2100 hours. Sampling effort is distributed equally to all three weekday strata. Sampling effort for weekend and holiday strata was allocated 25%, 50%, and 25% to strata 4, 5, and 6, respectively. The length of each sample period for this harvest survey was 4 hours.

The Delta Clearwater River harvest survey was conducted from 6 June through 7 September 1987. Twenty angler count and interview sample periods are collected each month. The sample periods were distributed as described above. Angler counts take approximately 1 hour to complete. The remainder of the 4 hour sample period was used to collect angler interviews. The majority of the angler interviews were from complete trips.

The field sampling procedure was as follows. At the start of a selected 4 hour sampling period, the creel clerk launched a river boat at the Clearwater Campground which was located in the center of the creel census area. Whether the angler count or angler interviews were conducted first, and the direction (upstream or downstream) of sampling were determined by coin tosses. Angler counts were made in one direction and anglers were interviewed in the opposite direction. The same procedure was followed for the angler count and angler interviews in the other half of the fishery. Angler counts in each direction took approximately 1/2 hour to be completed.

### Results and Discussion

Creel census at the Delta Clearwater River Arctic grayling fishery began on 6 June and ended on 7 September. Sixty-one angler counts were conducted (Table 25). During the creel census, 307 anglers were interviewed, of which 131 were complete trip interviews and 176 were incomplete trip angler interviews. Estimated angler effort was 4,476 hours with 44% of the angler effort expended during July. CPUE was estimated to be 1.10 and HPUE was 0.41 (Table 25). An estimated 4,920 Arctic grayling were caught and 1,838 Arctic grayling harvested. Although July accounted for almost half of the angler effort, July catch and harvest were only 26% and 30% of the totals, respectively. The distribution of angler catch and harvest shows that 28% of the anglers caught no Arctic grayling while about 3% of the anglers caught over 5 Arctic grayling (Table 26).

Biological data were collected from 209 harvested Arctic grayling. Harvested Arctic grayling ranged in age from 3 to 11 years (Table 27). Age 5 Arctic grayling made up 25% of the harvest. Almost 90% of the harvested Arctic grayling ranged from 3 to 8 years of age. The mean fork length of all Arctic grayling harvested was 338 mm, which falls in the middle of the mean fork length of age 7 and 8 fish. Relative stock density of harvested Arctic grayling shows that 55% are of quality length and 99% are quality and preferred lengths. No Arctic grayling were above 449 mm.

The majority of the anglers interviewed were male (69%), adult (89%), resident (86%), and non-local (not from Delta Junction) (85%) (Table 28). Also, 10% and 19% of anglers were tourists and military personnel, respectively. Most anglers interviewed used either spinners (45%) or flies (47%) as their terminal fishing gear, with the rest using jigs (8%). Anglers interviewed gave the fishery a rating of 3.02 or fair (Table 29). Of these, approximately 72% of the anglers rated the fishery as either fair or poor. Over 70% of the anglers interviewed approved of: (1) a 12 inch minimum length limit for Arctic grayling; (2) a no-bait restriction at the Delta Clearwater River, and (3) catch and release fishing only until the first Saturday in June.

Table 25. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of Arctic grayling at the Delta Clearwater River Arctic grayling fishery, 1987.

Strata	Angler												
	Angler Effort			Interviews		CPUE		HPUE		Catch		Harvest	
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Mean	SE	Total	SE	Total	SE
Jun 6 - Jun 30	18	1,411	287	54	46	0.89	0.33	0.43	0.14	1,256	561	602	239
Jul 1 - Jul 31	20	1,969	346	55	82	0.66	0.17	0.28	0.13	1,300	372	554	151
Aug 1 - Sep 7	23	1,096	286	22	49	2.16	0.75	0.63	0.24	2,364	1,630	682	350
Jun 6 - Sep 7	61	4,476	533	131	176	1.10	0.43	0.41	0.17	4,920	1,763	1,838	450

<sup>1</sup> Number of instantaneous hourly angler counts.

<sup>2</sup> Number of completed trip angler interviews.

<sup>3</sup> Number of incompleted trip angler interviews.

Table 26. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Delta Clearwater River Arctic grayling fishery, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	35	27%	27%	0	0%	0%	54	41%	41%	0	0%	0%
1	18	14%	40%	18	5%	5%	27	21%	62%	27	17%	17%
2	21	16%	56%	42	12%	18%	28	21%	83%	56	35%	52%
3	24	18%	75%	72	21%	39%	14	11%	94%	42	26%	78%
4	7	5%	80%	28	8%	47%	5	4%	98%	20	13%	91%
5	13	10%	90%	65	19%	66%	3	2%	100%	15	9%	100%
6	1	1%	91%	6	2%	68%						
7	4	3%	94%	28	8%	76%						
8	2	2%	95%	16	5%	81%						
9	2	2%	97%	18	5%	86%						
10	1	1%	98%	10	3%	89%						
11	2	2%	99%	22	6%	96%						
15	1	1%	100%	15	4%	100%						
Total	131			340			131			160		

<sup>1</sup> Number of anglers interviewed (complete trip only) that caught or harvested a certain number of Arctic grayling.

<sup>2</sup> Number of Arctic grayling caught or harvested by that group of anglers interviewed.

Table 27. Estimates of the contributions of each age class, mean fork length (mm) at age, and relative stock density (RSD) of Arctic grayling in the harvest sample from the Delta Clearwater River Arctic grayling fishery, 1987.

Age	<u>Age Composition</u>			<u>Fork Length</u>		<u>Relative Stock Density</u>				
	n	%	SE	Mean	SE	Category	Range <sup>1</sup>	n	%	SE
3	3	1.4%	6.9%	287	23	Stock	150-269	2	1.0%	6.9%
4	28	13.4%	6.4%	304	4	Quality	270-339	115	55.0%	4.6%
5	53	25.4%	6.0%	312	3	Preferred	340-449	92	44.0%	5.2%
6	43	20.6%	6.2%	332	4	Memorable	450-559	0	0.0%	—
7	31	14.8%	6.4%	347	4	Trophy	560-Up	0	0.0%	—
8	26	12.4%	6.5%	379	5					
9	14	6.7%	6.7%	380	9					
10	7	3.3%	6.8%	396	6					
11	4	1.9%	6.9%	415	5					
Total 209				338	3	Total		209		

<sup>1</sup> Range is the fork length range of the RSD category in mm.

Table 28. Monthly demographic profiles of anglers interviewed at the Delta Clearwater River Arctic grayling fishery, 1987.

Angler Characteristic	June <sup>1</sup>		July		August <sup>2</sup>		Total	
	n	%	n	%	n	%	n	%
Total Number of Interviews	100	—	137	—	71	—	308	—
Male	67	67%	89	65%	55	79%	211	69%
Female	33	33%	48	35%	15	21%	96	31%
Adult	95	95%	121	88%	56	80%	272	89%
Youth	5	5%	16	12%	14	20%	35	11%
Resident	78	78%	130	95%	56	80%	264	86%
Non-resident	22	22%	7	5%	14	20%	43	14%
Local	10	10%	20	15%	16	25%	46	15%
Non-local	89	90%	115	85%	47	75%	252	85%
Tourist	13	13%	6	4%	13	18%	32	10%
Military	7	7%	5	4%	45	64%	57	19%
Neither	80	80%	126	92%	13	18%	219	71%
Gear Types:								
Spinners	60	62%	56	41%	22	31%	138	45%
Jigs	13	13%	9	7%	2	3%	24	8%
Flies	24	25%	72	52%	46	66%	142	47%

<sup>1</sup> Angler interviews from 6 June thru 31 June 1987.

<sup>2</sup> Angler interviews from 1 August thru 7 September 1987.

Table 29. Opinions of anglers interviewed at the Delta Clearwater River Arctic grayling fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	17	5.7%	1.3%
	Good (2)	65	21.7%	2.4%
	Fair (3)	112	37.5%	2.8%
	Poor	105	35.1%	2.8%
	Total	299		
	Mean Rating = 3.02			
2. What is your opinion of a 12 inch minimum length limit for Arctic grayling?	Approve	131	73.6%	3.3%
	Disapprove	8	4.5%	1.6%
	No Opinion	39	21.9%	3.1%
	Total	178		
3. What is your opinion of a no-bait restriction at the Delta Clearwater River?	Approve	128	71.9%	3.3%
	Disapprove	11	6.2%	1.8%
	No Opinion	39	21.9%	3.1%
	Total	178		
4. What is your opinion of only catch and release Arctic grayling fishing until June 6?	Approve	129	72.5%	3.4%
	Disapprove	10	5.6%	1.7%
	No Opinion	39	21.9%	3.1%
	Total	178		

## CHAPTER 6 - FIELDING LAKE LAKE TROUT AND GRAYLING FISHERY

### Introduction

Fielding Lake provides a popular lake trout, Arctic grayling, and burbot fishery located 108 km south of Delta Junction on the Richardson Highway. Fielding Lake is a large (672 ha) oligotrophic lake situated at an elevation of 904 meters in the Alaska Range. A 2 mile gravel road links the lake to the highway. Facilities at Fielding Lake include a commercial boat launching site, a lodge, a State campground, and numerous private cabins.

Since 1981, angling pressure on Fielding Lake has averaged 1,574 angler days annually with 265 lake trout, and 1,173 Arctic grayling harvested (Mills 1982-1987). Burbot harvest averaged 327 fish annually from 1981-1983. Burbot during this time were harvested almost exclusively with set lines. The burbot set line fishery was closed in 1984 from 17 May to 31 December. In 1985, a regulation limited burbot fishing to hand held rods from 16 May to 14 October. Regulations since 1985 have completely eliminated the use of set lines in Fielding Lake. Burbot harvest since 1984 has been almost zero.

On site creel census programs were conducted in 1976, 1982, 1985, and 1986. HPUE estimates have ranged from 0.31 to 0.45 Arctic grayling per hour and from 0.02 to 0.07 lake trout per hour (Peckham 1977, 1983; Holmes et al. 1986, and Clark and Ridder 1987). The creel censuses conducted at Fielding Lake in 1985 and 1986 were continued in 1987. The goal of the creel census is to provide a long term database of CPUE, HPUE, catch, harvest, angler effort, biological data, and angler information for this mixed species fishery. This information will be used to develop management strategies that will sustain these wild fish stocks and still provide adequate angling opportunities.

### Methods

Access to Fielding Lake is limited to a single road from the Richardson Highway. All anglers enter and leave the fishery in a confined access area at a commercial boat launch facility. Fishing begins on the lake about the middle of June after ice goes out. Both shore and boat anglers use the area. Angling for Arctic grayling occurs at two areas: (1) the main lake, and (2) the outlet. Lake trout are harvested exclusively in the main part of the lake. This creel census is a stationary harvest survey.

The creel census at Fielding Lake was scheduled from 15 June through 31 August 1987. The angling day was defined as 0800 to 2400 hours. Two sampling strata per statistical period were used: (1) weekdays 0800 to 2400 hours and (2) weekends and holidays 0800 to 2400 hours. During the first 4 weeks of the fishery (time period 1), angler counts and interviews were conducted on 20 randomly selected sample periods. Sample periods were allocated 60% and 40% to strata 1 and 2, respectively. Only completed trip angler interviews were conducted. Angler counts were made at randomly selected times within each hour of the fishing day. Angler counts are made separately for Fielding Lake and Fielding Outlet. Counts of anglers on the lake were made from a boat and took about 15 minutes to complete. Angler counts of Fielding Outlet can be from a single viewpoint where the outlet

leaves the lake. The same procedure was used for the remainder of the fishery, except angler counts and interviews were conducted during 12 randomly selected sample periods per month. Sample units were allocated the same as before. The sample period for Fielding Lake was 4 hours.

Because this is a mixed species fishery in the main part of the lake, angler effort was allocated by multiplying the percent of the anglers interviewed that are targeting for lake trout and Arctic grayling times the estimated angler effort. Also, CPUE, HPUE, catch, and harvest are estimated for each species from anglers that were targeting that species.

### Results and Discussion

The creel census of Fielding Lake and Fielding Lake Outlet was conducted from 15 June through 31 August 1987. Eighty-five angler counts were performed at the outlet and 77 at the lake (Table 30). At Fielding Outlet, 32 incomplete angler interviews were made. CPUE and HPUE estimates were 1.90 and 0.76 Arctic grayling. At Fielding Outlet, 581 Arctic grayling were caught and 233 were harvested. In comparison, 89 complete trip and 4 incomplete trip angler interviews (anglers that were only targeting for Arctic grayling) were made at Fielding Lake. Estimated angler effort for Arctic grayling was 1,307 hours. CPUE and HPUE were 0.68 and 0.42, respectively. Estimated Arctic grayling catch and harvest in the lake were 1,359 and 845, respectively. Therefore, 1,940 Arctic grayling were caught with 1,078 being harvested in the entire Fielding Lake and Outlet system.

In looking at lake trout estimates, 36 complete trip and 5 incomplete angler interviews were made at Fielding Lake in 1987 (Table 31). Estimated CPUE was 0.10 and estimated HPUE was 0.03 fish per hour. Estimated lake trout catch was 202 with 31% (62) being harvested. The majority of the lake trout catch (73%) and harvest (79%) occurred from 15 June through 30 June 1987.

Of the anglers interviewed at both Fielding Lake and the Outlet that were targeting Arctic grayling, 45% and 55% had caught no Arctic grayling (Table 32). Also, 55% of the Arctic grayling catch was accounted for anglers who caught five or fewer fish. However, the same anglers accounted for 100% of the harvest. Of the anglers interviewed that were targeting lake trout, no anglers caught more than two lake trout. Only 19% of the anglers targeting on lake trout caught lake trout and only 8% of these anglers harvested any lake trout.

Biological data were collected from 125 Arctic grayling in the harvest sample at Fielding Lake and the Outlet in 1987. Age of Arctic grayling in the harvest ranged from 2 to 9 years with age 4 fish comprising 39% of the harvest (Table 33). Also, ages 3-7 Arctic grayling comprised over 90% of the harvest. Mean fork length of Arctic grayling was 300 mm. This is the approximate length of an age 5 fish. Comparisons of RSD's for Fielding Lake and the Outlet show that 61% of the Arctic grayling in the outlet were stock size while only 23% of the fish in the lake were stock size (Table 34). The overall RSD for both areas combined indicated that the Arctic grayling were almost evenly distributed between stock (36%), quality (35%), and preferred (29%) length categories.

Demographic profiles of the mixed fisheries at Fielding Lake show that the majority of the anglers interviewed are male, adult, resident, and non-local (not from the Fielding Lake area) (Table 35). The major difference between the fisheries is the gear type. At Fielding Lake Outlet, 54% of the Arctic grayling anglers used jigs. On the other hand, 78% of Arctic grayling anglers used spinners in the lake. Lake trout anglers were split with 48% and 52% using spinners and trolling, respectively.

Lake trout anglers interviewed at Fielding Lake gave the fishing a mean rating of 2.54 which falls between good and fair (Table 36). When asked to compare current fishing to fishing in prior years, these same anglers all said the lake trout fishing was either the same, worse, or had no opinion. Forty-one percent of the lake trout anglers said that public boat access was adequate. Also, 63% approved of an 18 inch minimum length limit for lake trout and 83% approved a two lake trout daily bag and possession limit.

Arctic grayling anglers at Fielding Lake gave the Arctic grayling fishing a better rating than the anglers at Fielding Outlet (Table 37). Three percent of the anglers at both areas rated the fishing as excellent. However, 60% of the anglers at Fielding Lake rated the fishing as good as compared to only 41% at Fielding Outlet. The majority of anglers at both areas said that current fishing when compared to fishing in prior years was the same, worse, or had no opinion. The majority of anglers at both areas said public boat access was adequate and they approved of a minimum length limit for Arctic grayling.

Table 30. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of Arctic grayling at Fielding Lake and Fielding Lake Outlet, 1987.

Strata	Angler												
	Angler Effort			Interviews		CPUE		HPUE		Catch		Harvest	
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Mean	SE	Total	SE	Total	SE
<u>Fielding Outlet</u>													
Jun 15 - Jun 30													
Weekdays	14	14	49	0	0	—	—	—	—	—	—	—	—
Weekends	14	23	42	0	3	0.50	0.48	0.00	0.00	11	13	0	0
Jul 1 - Jul 31													
Weekdays	16	92	208	0	6	2.08	0.39	0.80	0.07	191	426	73	164
Weekends	18	57	124	0	11	1.86	0.64	0.58	0.13	106	219	33	71
Aug 1 - Aug 31													
Weekdays	10	134	320	0	9	2.03	0.86	0.94	0.23	273	600	127	295
Weekends	13	0	0	0	3	0.00	0.00	0.00	0.00	0	0	0	0
Jun 15 - Aug 31	85	320	119	0	32	1.90	0.68	0.76	0.17	581	767	233	345
<u>Fielding Lake</u>													
Jun 15 - Jun 30													
Weekdays	10	340	292	11	0	0.74	0.34	0.53	0.26	411	366	294	263
Weekends	10	95	83	12	0	0.72	0.26	0.57	0.27	147	131	116	105
Jul 1 - Jul 31													
Weekdays	16	465	1,280	23	0	0.59	0.12	0.42	0.12	396	1,070	279	741
Weekends	18	320	352	31	1	0.89	0.20	0.27	0.07	355	447	106	133
Aug 1 - Aug 31													
Weekdays	10	65	200	0	0	—	—	—	—	—	—	—	—
Weekends	13	22	32	12	3	0.28	0.09	0.28	0.09	51	73	51	73
Jun 15 - Aug 31	77	1,307	160	89	4	0.68	0.23	0.42	0.18	1,359	1,225	845	807

<sup>1</sup> Number of instantaneous hourly angler counts.

<sup>2</sup> Number of completed trip angler interviews.

<sup>3</sup> Number of incompleted trip angler interviews.

Table 31. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of lake trout at Fielding Lake, 1987.

Strata	Angler Effort		Angler Interviews			CPUE		HPUE		Catch		Harvest	
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Mean	SE	Total	SE	Total	SE
Jun 15 - Jun 30													
Weekdays	10	217	186	5	2	0.24	0.16	0.06	0.06	132	122	33	33
Weekends	10	110	96	11	3	0.08	0.05	0.08	0.05	16	15	16	15
Jul 1 - Jul 31													
Weekdays	16	202	556	10	0	0.04	0.04	0.00	0.00	28	27	0	0
Weekends	18	80	101	8	0	0.06	0.04	0.03	0.03	26	30	13	13
Aug 1 - Aug 31													
Weekdays	10	67	209	0	0	---	---	---	---	---	---	---	---
Weekends	13	163	240	2	0	0.00	0.00	0.00	0.00	0	0	0	0
Jun 15 - Aug 31	77	839	363	36	5	0.10	0.09	0.03	0.04	202	129	62	39

- 1 Number of instantaneous hourly angler counts.
- 2 Number of completed trip angler interviews.
- 3 Number of incompleted trip angler interviews.

Table 32. Distribution of Arctic grayling and lake trout catch and harvest among anglers interviewed at Fielding Lake, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
<u>Arctic Grayling</u>												
0	40	45%	45%	0	0%	0%	49	55%	55%	0	0%	0%
1	13	15%	60%	13	7%	7%	16	18%	73%	32	31%	31%
2	12	14%	74%	24	14%	21%	10	11%	84%	20	19%	50%
3	7	8%	82%	21	12%	33%	6	7%	91%	18	17%	67%
4	5	6%	88%	20	11%	44%	5	6%	97%	20	19%	86%
5	4	4%	92%	20	11%	55%	3	3%	100%	15	14%	100%
6	3	3%	95%	18	10%	65%						
7	1	1%	96%	7	4%	69%						
8	1	1%	97%	8	5%	74%						
10	1	1%	98%	10	6%	80%						
12	1	1%	99%	12	7%	87%						
22	1	1%	100%	22	13%	100%						
	89			175			89			105		
<u>Lake Trout</u>												
0	30	81%	81%	0	0%	0%	34	92%	92%	0	0%	0%
1	5	14%	95%	5	33%	33%	3	8%	100%	3	100%	100%
2	2	5%	100%	10	67%	100%						
	37			15			37			3		

<sup>1</sup> Number of anglers interviewed (complete trip only) that caught or harvested a certain number of Arctic grayling.

<sup>2</sup> Number of Arctic grayling caught or harvested by that group of anglers.

Table 33. Estimates of the contributions of each age class, and mean fork length (mm) at age of Arctic grayling in the harvest sample from Fielding Lake and Fielding Lake Outlet, 1987.

Age	Age Composition			Fork Length	
	n	%	SE	Mean	SE
2	1	0.8%	0.8%	200	—
3	13	10.4%	2.7%	237	4
4	49	39.2%	4.4%	259	4
5	18	14.4%	3.1%	300	5
6	14	11.2%	2.8%	347	5
7	19	15.2%	3.2%	370	4
8	7	5.6%	2.1%	388	6
9	4	3.2%	1.6%	396	10
Total	125			300	5

Table 34. Relative stock density (RSD) of Arctic grayling in the harvest sample at Fielding Lake and Fielding Lake Outlet, 1987.

Category	Range <sup>1</sup>	<u>Fielding Lake</u>			<u>Fielding Outlet</u>			<u>Combined</u>		
		n	%	SE	n	%	SE	n	%	SE
Stock	150-269	23	23%	4%	31	61%	7%	54	36%	4%
Quality	270-339	39	39%	5%	14	27%	6%	53	35%	4%
Preferred	340-449	37	37%	5%	6	12%	5%	43	29%	4%
Memorable	450-559	0	0%	—	0	0%	—	0	0%	—
Trophy	560-Up	0	0%	—	0	0%	—	0	0%	—
Total		99			51			150		

<sup>1</sup> Range is the fork length range for the RSD category in mm.

Table 35. Demographic profiles of anglers interviewed at the Fielding Lake and Fielding Lake Outlet Arctic grayling fisheries, and Fielding Lake lake trout fishery, 1987.

Angler Characteristic	<u>Grayling Fishery</u>				<u>Lake Trout Fishery</u>		<u>Combined</u>	
	<u>Outlet</u>		<u>Lake</u>		<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
Total Number of Angler Interviews	32	—	90	—	37	—	159	—
Male	23	72%	66	73%	28	76%	117	74%
Female	9	28%	24	27%	9	24%	42	26%
Adult	27	84%	81	90%	32	86%	140	88%
Youth	5	16%	9	10%	5	14%	19	12%
Resident	26	87%	86	96%	33	89%	145	92%
Non-resident	4	13%	4	4%	4	11%	12	8%
Local	0	0%	3	4%	1	3%	4	3%
Non-local	30	100%	78	96%	29	97%	137	97%
Tourist	1	3%	2	2%	3	8%	6	4%
Military	4	13%	6	7%	1	3%	11	7%
Neither	27	84%	82	91%	33	89%	142	89%
Gear Types:								
Spinners	8	31%	72	78%	14	48%	94	64%
Bait	2	8%	0	0%	0	0%	2	1%
Jigs	14	54%	0	0%	0	0%	14	10%
Trolling	2	8%	2	2%	15	52%	19	13%
Flies	0	0%	18	20%	0	0%	18	12%

Table 36. Opinions of anglers interviewed at the Fielding Lake lake trout fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	1	3%	2.9%
	Good (2)	18	51%	8.5%
	Fair (3)	12	34%	8.0%
	Poor (4)	4	11%	5.3%
	Total	35		
	Mean Rating =	2.54		
2. How does the quality of fishing compare to fishing in prior years?	Better	0	0%	—
	Same	9	45%	11.1%
	Worse	3	15%	8.0%
	No Opinion	8	40%	11.0%
	Total	20		
3. Is public boat access adequate?	Yes	14	41%	8.4%
	No	5	15%	6.1%
	No Opinion	15	44%	8.5%
	Total	34		
4. What is your opinion of a 18 inch minimum length limit for lake trout?	Approve	15	63%	9.9%
	Disapprove	7	29%	9.3%
	No Opinion	2	8%	5.5%
	Total	24		
5. What is your opinion of a daily bag and possession limit of two lake trout?	Approve	20	83%	7.7%
	Disapprove	1	4%	4.0%
	No Opinion	3	13%	6.7%
	Total	24		

Table 37. Opinions of anglers interviewed at the Fielding Lake and Fielding Lake Outlet Arctic grayling fisheries, 1987.

Question	Opinion	Fielding Outlet			Fielding Lake			Combined		
		n	%	SE	n	%	SE	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	1	3%	3%	3	3%	2%	4	3%	2%
	Good (2)	13	41%	9%	53	60%	5%	66	55%	5%
	Fair (3)	17	53%	9%	28	31%	5%	45	37%	4%
	Poor (4)	1	3%	3%	5	6%	2%	6	5%	2%
	Total	32			89			121		
	Mean Rating =	2.56			2.39			2.44		
2. How does the quality of fishing compare to fishing in prior years?	Better	3	12%	6%	6	13%	5%	9	13%	4%
	Same	3	12%	6%	20	43%	7%	23	32%	6%
	Worse	6	24%	9%	6	13%	5%	12	17%	4%
	No Opinion	13	52%	10%	14	30%	7%	27	38%	6%
	Total	25			46			71		
3. Is public boat access adequate?	Yes	8	31%	9%	42	91%	4%	50	69%	5%
	No	2	8%	5%	3	7%	4%	5	7%	3%
	No Opinion	16	62%	10%	1	2%	2%	17	24%	5%
	Total	26			46			72		
4. What is your opinion of a minimum length limit for Arctic grayling?	Approve	18	86%	8%	22	56%	8%	40	67%	6%
	Disapprove	0	0%	—	2	5%	4%	2	3%	2%
	No Opinion	3	14%	8%	15	38%	8%	18	30%	6%
	Total	21			39			60		

## CHAPTER 7 - PAXSON LAKE SUMMER LAKE TROUT FISHERY

### Introduction

Paxson Lake is located 125 km south of Delta Junction on the Richardson Highway at the headwaters of the Gulkana River (Figure 6). Paxson Lake covers an area of 1,576 ha. The lake is located at an elevation of 774 m in the Alaska range. A public boat launch facility is at the northern end of the lake. The Bureau of Land Management (BLM) maintains a campground at the southern end of the lake. The campground serves as a popular starting point for raft trips down the upper part of the Gulkana River. Access to Paxson Lake is limited to a boat launch facility at the northern end of the lake, a BLM campground at the southern end of the lake, and three roadside pulloffs on the Richardson Highway (Figure 6). Both shore and boat anglers use these areas. The majority of anglers are fishing for lake trout.

Paxson lake supports a popular fishery for lake trout, Arctic grayling, and burbot. Some angling also occurs for rainbow trout. In 1986, 2,549 angler-days were expended at Paxson Lake with harvests of 944 lake trout, 1,388 Arctic grayling, 452 burbot, and 178 rainbow trout (Mills 1987). In 1987, ADFG reduced the daily bag limit of lake trout to two with an 18 inch minimum length limit in affect. In addition, the daily bag limit of burbot was reduced to 5 fish and the legal number of hooks was reduced to 5 hooks in aggregate.

This creel census was primarily designed to gather base line information on the CPUE and HPUE of lake trout within Paxson Lake. In addition, lake trout harvest samples will provide needed information on age composition, mean fork length at age, age at maturity, and RSD of lake trout. The same information was collected for Arctic grayling in Paxson Lake.

### Methods

This creel census is a roving CPUE survey. The fishing day at Paxson Lake is considered to be from 0800 to 2400 hours. Each month is divided into two strata: (1) weekdays 0800 to 2400 hours and (2) weekends and holidays 0800 to 2400 hours. Sampling effort is allocated 60% and 40% to strata 1 and 2, respectively.

The Paxson Lake CPUE survey was scheduled from 15 June through 31 August 1987. Each month, 12 weekend and holiday, and 8 weekday sample periods are randomly selected for sampling. A sample period is 4 hours long. Anglers are contacted as they leave the fishery at one of the three access points. Approximately equal amounts of time are spent at each of the three areas. Creel clerks conduct only complete trip angler interviews. Because this is a mixed species fishery, only anglers targeting for a particular species are used to estimate CPUE and HPUE for that species.

### Results and Discussion

The creel census at Paxson Lake was conducted from 15 June through 31 August 1987. Almost 200 anglers were interviewed at Paxson Lake. However,

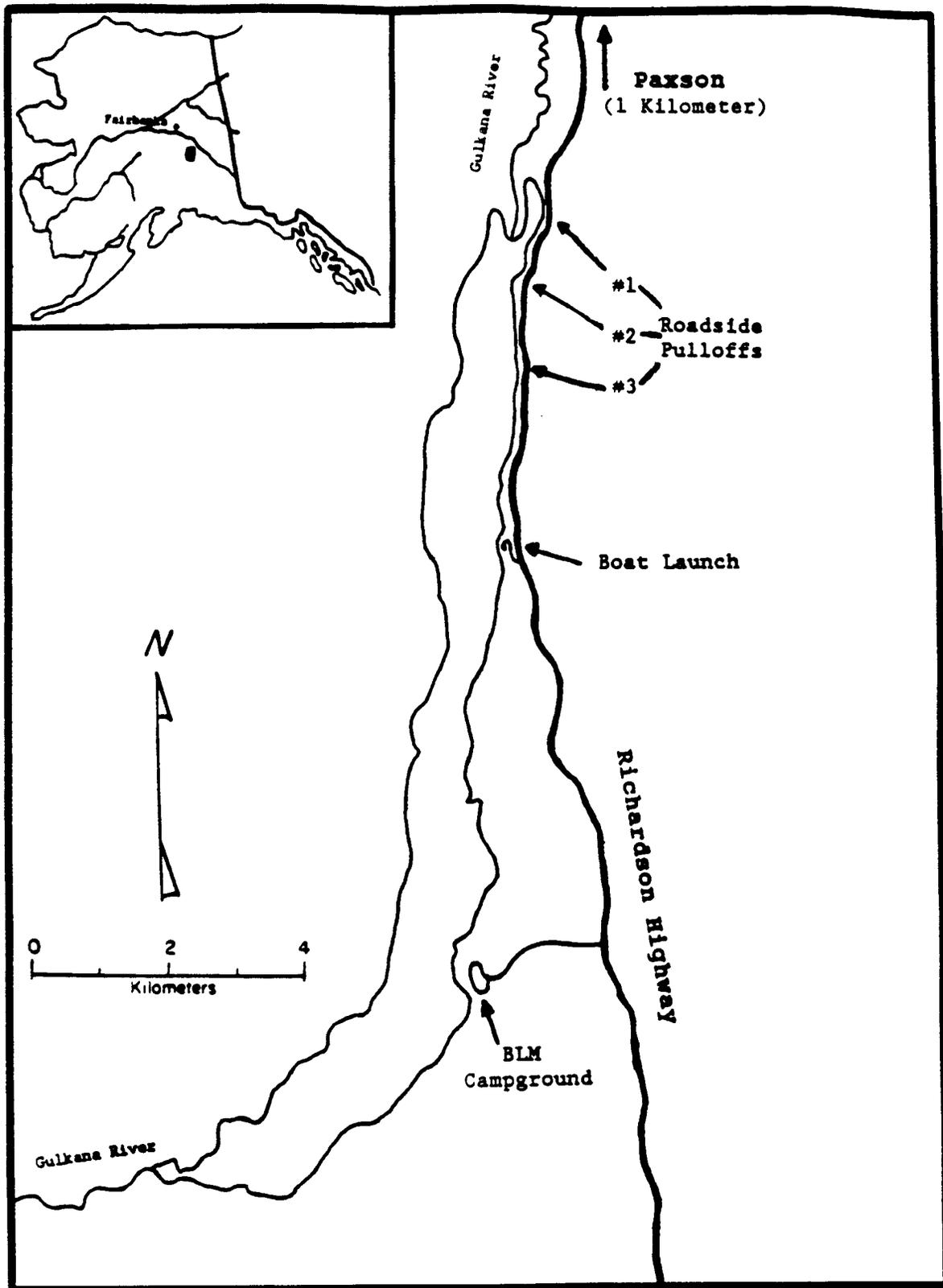


Figure 6. Location of the Paxson Lake lake trout and Arctic grayling fisheries, Copper River drainage, Alaska.

149 were targeting for lake trout (Table 38). Of these, 147 were complete trip and two were incomplete angler interviews. Estimated lake trout CPUE and HPUE was 0.251 and 0.126, respectively. Thus, approximately half of the lake trout caught are actually harvested. Distribution of lake trout catch and harvest shows that 85% of the anglers interviewed caught one or fewer lake trout and 93% harvested one or fewer lake trout (Table 39). No anglers caught more than five lake trout.

Biological data were collected in the harvest sample from 134 lake trout at Paxson Lake in 1986<sup>1</sup> and 1987. Lake trout ranged in age from 4 to 33 years (Table 40). Ages 4 and 5 comprised 44% of the harvest sample. Mean fork lengths of age 4 and 5 lake trout were 447 and 487 mm, respectively. Relative stock density of lake trout shows that 51% of the lake trout harvested are stock size, 33% quality size, 13% preferred size, and 2% memorable size. No trophy size lake trout (> 975 mm) were harvested.

The majority of the anglers interviewed at Paxson Lake were male (77%), adult (97%), residents of the State of Alaska (91%), and not from the Paxson area (95%) (Table 41). Also, 5% of the anglers were military and 7% were tourists. The majority of the lake trout anglers used spinners (51%) as their terminal fishing gear. Lake trout anglers gave Paxson Lake lake trout fishery a mean rating of 2.66; a fair to good rating (Table 42). Current fishing as compared to prior years fishing at Paxson Lake was found to be either the same (20%), worse (11%), or there was no opinion (66%). The majority of lake trout anglers said that public boat access was not adequate (57%), approved of an 18 inch minimum length limit for lake trout (76%), and approved of a daily bag and possession limit of two lake trout (63%).

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<sup>1</sup> Harvest samples were collected in 1986 from Paxson Lake by ADFG, Sport Fish Division personnel.

Table 38. Number of anglers interviewed, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) for lake trout at Paxson Lake, 1987.

Strata	Angler Interviews		CPUE		HPUE	
	C <sup>1</sup>	I <sup>2</sup>	Mean	SE	Mean	SE
Jun 15 - Jun 30						
Weekdays (0800-2400)	6	1	0.204	0.048	0.204	0.048
Weekends (0800-2400)	22	0	0.203	0.054	0.116	0.034
Jul 1 - Jul 31						
Weekdays (0800-2400)	26	0	0.174	0.070	0.104	0.042
Weekends (0800-2400)	49	1	0.220	0.058	0.121	0.030
Aug 1 - Aug 31						
Weekdays (0800-2400)	3	0	0.633	0.473	0.178	0.018
Weekends (0800-2400)	41	0	0.069	0.031	0.034	0.013
Jun 15 - Aug 31	147	2	0.251	0.200	0.126	0.080

<sup>1</sup> Number of complete trip angler interviews that targeted lake trout.

<sup>2</sup> Number of incomplete trip angler interviews that targeted lake trout

Table 39. Distribution of lake trout catch and harvest among anglers interviewed that were targeting for lake trout at Paxson Lake, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	76	51%	51%	0	0%	0%	97	66%	66%	0	0%	0%
1	50	34%	85%	50	47%	47%	40	27%	93%	40	63%	63%
2	13	9%	94%	26	24%	71%	7	5%	98%	14	22%	86%
3	4	3%	97%	12	11%	82%	3	2%	100%	9	14%	100%
4	1	1%	98%	4	4%	86%						
5	3	2%	100%	15	14%	100%						
Total	147			107			147			63		

<sup>1</sup> Number of anglers interviewed (complete trip only) caught or harvested a certain number of lake trout.

<sup>2</sup> Number of lake trout caught or harvested by that group of anglers.

Table 40. Estimates of the contributions of each age class, mean fork length (mm) at age, and relative stock density (RSD) of lake trout<sup>1</sup> in the harvest sample at the Paxson Lake lake trout fishery, 1987.

Age	Age Composition			Fork Length		Relative Stock Density				
	n	%	SE	Mean	SE	Category	Range <sup>2</sup>	n	%	SE
4	4	3%	1%	377	9	Stock	260-494	71	51%	4%
5	27	20%	3%	409	4	Quality	495-594	46	33%	4%
6	30	22%	4%	447	7	Preferred	595-778	18	13%	3%
7	12	9%	2%	487	15	Memorable	779-974	3	2%	1%
8	9	7%	2%	513	13	Trophy	975-above	0	0%	—
9	5	4%	2%	524	8					
11	6	4%	2%	555	10	Total		138		
12	4	3%	1%	544	35					
13	6	4%	2%	656	53					
14	2	1%	1%	686	77					
15	5	4%	2%	574	9					
16	2	1%	1%	583	11					
17	1	1%	1%	561	—					
18	2	1%	1%	591	11					
19	5	4%	2%	595	7					
20	1	1%	1%	609	—					
21	3	2%	1%	549	11					
22	1	1%	1%	572	—					
23	3	2%	1%	695	97					
24	2	1%	1%	758	170					
26	1	1%	1%	665	—					
29	2	1%	1%	583	13					
33	1	1%	1%	610	—					
Total 134										

<sup>1</sup> Lake trout are from 1986 and 1987 harvest samples combined.

<sup>2</sup> Range is the fork length range of the RSD category in mm.

Table 41. Demographic profile of anglers interviewed at the Paxson Lake lake trout fishery, 1987.

Angler Characteristics			Angler Characteristics				
	n	%	SE		n	%	SE
Total Number of Angler Interviews	147	—	—	Local	8	5%	1.8%
				Non-local	141	95%	1.8%
Male	109	77%	3.5%	Military	8	5%	1.8%
Female	32	23%	3.5%	Tourist	11	7%	2.1%
Adult	143	97%	1.4%	Neither	128	87%	2.8%
Youth	4	3%	1.4%	Gear Types:			
Resident	136	91%	2.3%	Spinners	75	51%	4.1%
Non-resident	13	9%	2.3%	Bait	27	18%	3.2%
				Trolling	45	31%	3.8%

Table 42. Opinions of anglers interviewed at the Paxson Lake lake trout fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	7	4.9%	1.8%
	Good (2)	55	38.5%	4.1%
	Fair (3)	62	43.4%	4.1%
	Poor (4)	19	13.3%	2.8%
	Total	143		
	Mean Rating = 2.66			
2. How does current fishing this year compare to fishing in prior years?	Better	4	3.6%	1.8%
	Same	22	19.6%	3.8%
	Worse	12	10.7%	2.9%
	No Opinion	74	66.1%	4.5%
	Total	112		
3. Is public boat access adequate?	Yes	36	35.0%	4.7%
	No	59	57.3%	4.9%
	No Opinion	8	7.8%	2.6%
	Total	103		
4. What is your opinion of a 18 inch minimum length limit for lake trout?	Approve	85	75.9%	4.0%
	Disapprove	15	13.4%	3.2%
	No Opinion	12	10.7%	2.9%
	Total	112		
5. What is your opinion of a daily bag and possession limit of two lake trout?	Approve	70	62.5%	4.6%
	Disapprove	29	25.9%	4.1%
	No Opinion	13	11.6%	3.0%
	Total	112		

## CHAPTER 8 - PILEDRIVER SLOUGH RAINBOW TROUT AND GRAYLING FISHERY

### Introduction

Piledriver Slough is a slough of the Tanana River originating about 48 km east of Fairbanks (Figure 7). Dike construction from the Moose Creek Flood Control Project blocked the mouth of the Slough in the late 1970's. With the silty waters of the Tanana River blocked, clear spring water began to flow. Because of this, Arctic grayling began using Piledriver Slough and an early season fishery has developed. Mills (1986) estimated that 3,500 angler-days were expended on Piledriver Slough in 1985 to harvest 2,000 Arctic grayling.

An on-site creel census was first conducted on Piledriver Slough in 1985. The mean fork length of harvested Arctic grayling was 250 mm. Only 4% of the fish were of spawning size (> 270 mm) (Holmes et al. 1986). In 1986, the mean fork length of Arctic grayling was 243 mm (Clark and Ridder 1987). However, 15% of the Arctic grayling were of spawning size (> 270 mm).

In 1987, emergency regulations were instituted on Piledriver Slough fishery. These included: (1) a 12 inch minimum total length for Arctic grayling, (2) catch and release Arctic grayling fishing only until the first Saturday in June, and (3) a no-bait restriction (flies and lures only). These regulations were put forth to protect this newly developing fishery from overharvest by allowing more grayling to reach spawning size.

During the summer of 1987, ADFG, Sport Fish Division stocked Swanson River strain rainbow trout into Piledriver Slough. This was the first stocking of rainbow trout into an open system (not landlocked) in the interior of Alaska. Both catchable, sub-catchable, and fingerling size rainbow trout were stocked.

The objectives of the Piledriver Slough creel census are to estimate Arctic grayling and rainbow trout CPUE, and HPUE. The long term goals of the Piledriver Slough creel census are to develop a database of CPUE, HPUE, and biological data for Arctic grayling and rainbow trout to assess management regulations and determine optimal stocking policies for rainbow trout in streams.

### Methods

Access to Piledriver Slough is provided at three road crossings and two roadside parking areas. Almost all the fishing is from shore. This creel census is a roving CPUE survey. The creel census is conducted from 1 May through 31 August.

Angler effort is concentrated in the evenings and on weekends. A fishing day is defined to occur from 0800 to 2200 hours. Three sampling strata are used in this fishery: (1) weekdays 0800 to 1600 hours; (2) weekdays 1600 to 2200 hours; and (3) weekends and holidays 0800 to 2200 hours. Sampling effort is allocated 20, 40%, and 40% to strata 1, 2, and 3, respectively. The sample period for creel census is 2 hours.

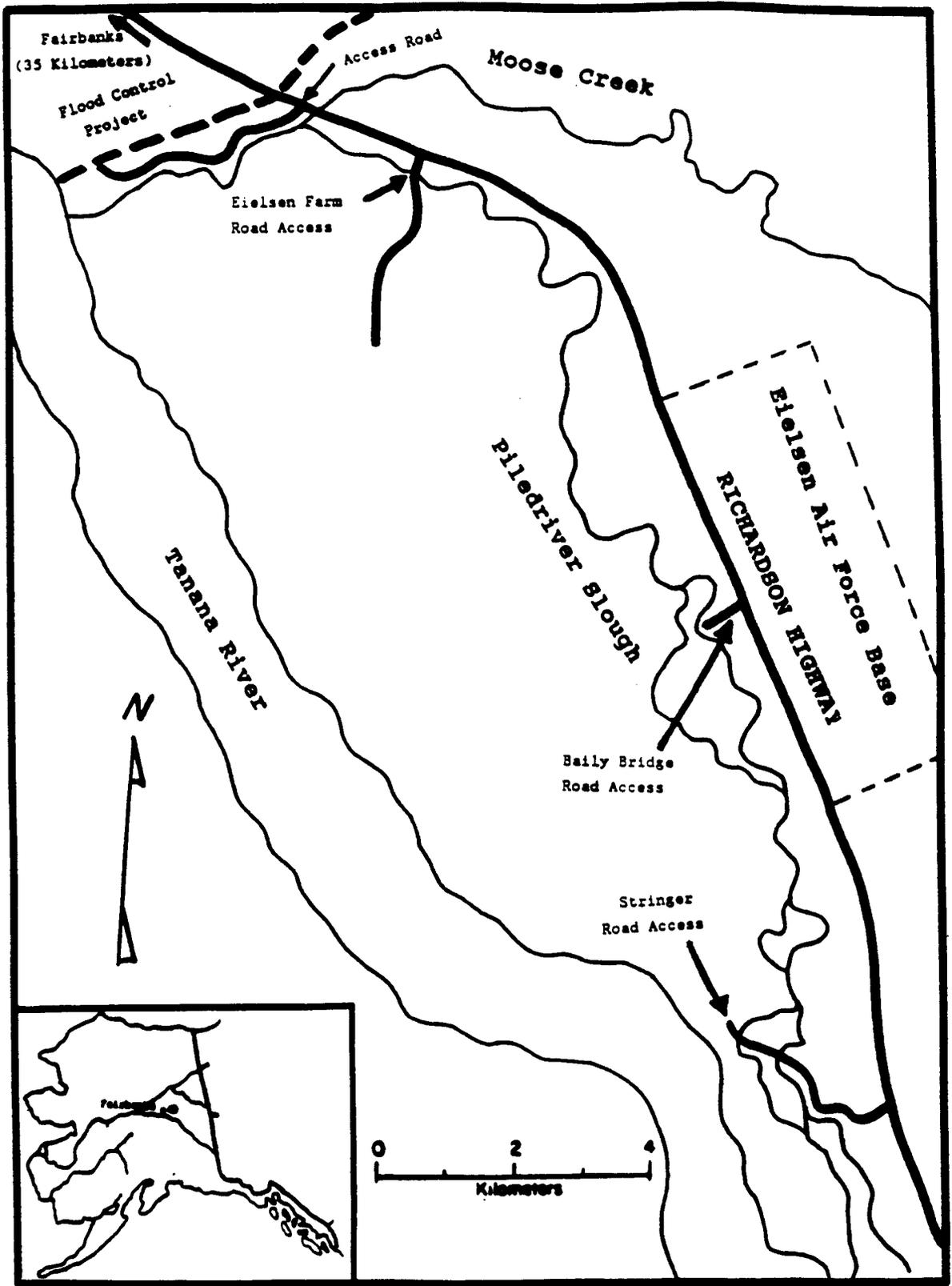


Figure 7. Location of Piledriver Slough, Tanana River drainage, Alaska.

A total of 30 samples per month were collected at randomly selected times distributed among strata as described above. At the beginning of a two sample sampling period, the creel clerk drove the Richardson Highway eastward and interviewed all anglers that could be accessed along Piledriver Slough. Angler interviews were conducted in reverse order on the way back to Fairbanks. Anglers previously interviewed were not re-interviewed. The majority of interviews are from anglers who have not yet completed fishing.

### Results and Discussion

The Piledriver Slough creel census began on 25 April and was conducted through 31 August 1987. During the creel census, 859 anglers were interviewed of which 777 were incomplected trip interviews and 82 completed trip interviews (Table 43). Estimated CPUE and HPUE of rainbow trout was 1.55 and 0.49, respectively. Rainbow trout CPUE peaked during June at 3.36. However, rainbow trout HPUE peaked in July 1.04. Estimated Arctic grayling CPUE was 0.95 and estimated HPUE was 0.05. Arctic grayling CPUE peaked from 25 April through 31 May at 1.70.

Sixty-three percent of the anglers interviewed caught no Arctic grayling and 90% harvested no Arctic grayling (Table 44). Anglers who caught 5 or fewer Arctic grayling accounted for 22% of the catch while accounting for 100% of the harvest. Anglers interviewed caught from 0 to 40 rainbow trout with 57% catching no rainbow trout and 79% harvesting zero rainbow trout (Table 45). Anglers interviewed who caught 10 or fewer rainbow trout accounted for 36% of the catch and 100% of the harvest.

Biological data were collected from 80 Arctic grayling in the harvest sample at Piledriver Slough. Arctic grayling ranged in age from 1 to 6 years (Table 46). Age 4 Arctic grayling constituted 47% of the harvest sample. Over 95% of the harvest was made up of age 2 to age 5 fish. Mean fork length of the harvest sample was 248 mm which falls in the middle of the mean length of age 3 and 4 Arctic grayling. Relative stock densities were calculated for both Arctic grayling and rainbow trout. Over 70% of the Arctic grayling are stock size with the rest being quality size (Table 47). Sixty-seven percent of rainbow trout were quality size with 32% being stock size and 1% in the preferred length category.

Angler demographics were calculated for the Piledriver Slough rainbow trout and Arctic grayling fishery. The majority of the anglers were male (89%), adult (88%), residents of the State of Alaska (94%), and live in the Fairbanks area (96%) (Table 48). The fishery is also popular for military personnel (49%) because of it's proximity to Eielson Air Force Base. The anglers interviewed were split evenly on choice of fishing gear type with 49% using spinners and 46% using flies. Even though the fishery was closed to the use of bait, 4% of the anglers interviewed used bait.

Anglers gave the Piledriver Slough fishery a mean rating of 2.44, which is good to fair (Table 49). When asked opinions about management regulations, the anglers were highly in favor of stocking rainbow trout (95%), approved of a 12 inch minimum length limit for Arctic grayling (84%), and approved of a no-bait restriction at the fishery (72%).

Table 43. Number of anglers interviewed and estimates of CPUE (catch per hour), and HPUE (harvest per hour) for rainbow trout and Arctic grayling at Piledriver Slough, 1987.

Month	Angler Interviews		CPUE		HPUE	
	C <sup>1</sup>	I <sup>2</sup>	Mean	SE	Mean	SE
<u>Rainbow Trout</u>						
Apr 25 - May 31	25	404	0.54	0.25	0.16	0.10
Jun 1 - Jun 30	28	249	3.36	0.65	0.98	0.27
Jul 1 - Jul 31	21	85	2.62	0.52	1.04	0.26
Aug 1 - Aug 31	8	39	0.34	0.22	0.02	0.04
Apr 25 - Aug 31	82	777	1.55	0.43	0.49	0.19
<u>Arctic Grayling</u>						
Apr 25 - May 31	25	404	1.70	1.06	0.05	0.03
Jun 1 - Jun 30	28	249	0.53	0.20	0.03	0.02
Jul 1 - Jul 31	21	85	0.08	0.06	0.01	0.01
Aug 1 - Aug 31	8	39	0.99	0.41	0.10	0.12
Apr 25 - Aug 31	82	777	0.95	0.66	0.05	0.06

<sup>1</sup> Number of complete trip angler interviews.

<sup>2</sup> Number of incomplete trip angler interviews.

Table 44. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Piledriver Slough rainbow trout and Arctic grayling fishery, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	52	63%	63%	0	0%	0%	74	90%	90%	0	0%	0%
1	7	9%	72%	7	3%	3%	1	1%	91%	1	3%	3%
2	1	1%	73%	2	1%	4%	1	1%	93%	2	7%	10%
3	3	4%	77%	9	4%	7%	0	0%	93%	0	0%	10%
4	7	9%	85%	28	11%	18%	4	5%	98%	16	55%	66%
5	2	2%	88%	10	4%	22%	2	2%	100%	10	34%	100%
6	1	1%	89%	6	2%	25%						
7	1	1%	90%	7	3%	27%						
10	2	2%	93%	20	8%	35%						
15	2	2%	95%	30	12%	47%						
20	1	1%	96%	20	8%	55%						
22	1	1%	98%	22	9%	64%						
45	2	2%	100%	90	36%	100%						
Total	82			251			82			29		

<sup>1</sup> Number of anglers interviewed (complete trip only) that caught or harvested a certain number of Arctic grayling.

<sup>2</sup> Number of Arctic grayling caught or harvested by that group of anglers.

Table 45. Distribution of rainbow trout catch and harvest among anglers interviewed at the Piledriver Slough rainbow trout and Arctic grayling fishery, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	47	57%	57%	0	0%	0%	65	79%	79%	0	0%	0%
1	9	11%	68%	9	3%	3%	5	6%	85%	5	9%	9%
2	4	5%	73%	8	3%	6%	5	6%	91%	10	19%	28%
3	3	4%	77%	9	3%	9%	3	4%	95%	9	17%	45%
4	3	4%	80%	12	4%	13%	1	1%	96%	4	8%	53%
5	1	1%	82%	5	2%	14%	0	0%	96%	0	0%	53%
6	2	2%	84%	12	4%	18%	0	0%	96%	0	0%	53%
7	1	1%	85%	7	2%	21%	1	1%	98%	7	13%	66%
8	1	1%	87%	8	3%	23%	1	1%	99%	8	15%	81%
9	1	1%	88%	9	3%	26%	0	0%	99%	0	0%	81%
10	3	4%	91%	30	10%	36%	1	1%	100%	10	19%	100%
12	1	1%	93%	12	4%	40%						
13	1	1%	94%	13	4%	45%						
23	1	1%	95%	23	8%	53%						
30	1	1%	96%	30	10%	63%						
35	1	1%	98%	35	12%	74%						
37	1	1%	99%	37	12%	87%						
40	1	1%	100%	40	13%	100%						
	82			299			82			53		

<sup>1</sup> Number of anglers interviewed (complete trip only) that caught or harvested a certain number of rainbow trout.

<sup>2</sup> Number of rainbow trout caught or harvested by that group of anglers.

Table 46. Estimates of the contributions of each age class and mean fork length (mm) at age of Arctic grayling in the harvest sample at Piledriver Slough rainbow trout and Arctic grayling fishery, 1987.

Age	Age Composition			Fork Length	
	n	%	SE	Mean	SE
1	1	1.3%	1.2%	200	—
2	8	10.0%	3.4%	208	14
3	22	27.5%	5.0%	229	25
4	38	47.5%	5.6%	262	22
5	9	11.3%	3.5%	273	31
6	2	2.5%	1.7%	270	—
Total	80			248	31

Table 47. Relative stock density (RSD) of Arctic grayling and rainbow trout in the harvest sample at Piledriver Slough, 1987.

Category	Range <sup>1</sup>	n	%	SE
<u>Arctic Grayling</u>				
Stock	150-269	59	70.2%	5.0%
Quality	270-339	25	29.8%	5.0%
Preferred	340-449	0	0.0%	—
Memorable	450-559	0	0.0%	—
Trophy	560-above	0	0.0%	—
Total		84		
<u>Rainbow Trout</u>				
Stock	180-224	33	32.0%	4.6%
Quality	225-299	69	67.0%	4.6%
Preferred	300-374	1	1.0%	1.0%
Memorable	375-449	0	0.0%	—
Trophy	450-above	0	0.0%	—
Total		103		

<sup>1</sup> Range is the fork length range of the RSD category in mm.

Table 48. Monthly demographic profiles of anglers interviewed at the Piledriver Slough rainbow trout and Arctic grayling fishery, 1987.

Angler Characteristics	May <sup>1</sup>		June		July		August		Total	
	n	%	n	%	n	%	n	%	n	%
Total Number of Interviews	437	—	284	—	110	—	47	—	878	—
Male	395	92%	236	86%	91	86%	42	89%	764	89%
Female	34	8%	40	14%	15	14%	5	11%	94	11%
Adult	392	92%	228	84%	93	88%	35	76%	748	88%
Youth	33	8%	45	16%	13	12%	11	24%	102	12%
Resident	25	96%	97	96%	30	86%	31	94%	183	94%
Non-resident	1	4%	4	4%	5	14%	2	6%	12	6%
Local	218	99%	113	94%	37	88%	31	94%	399	96%
Non-local	1	1%	7	6%	5	12%	2	6%	15	4%
Tourist	6	1%	8	3%	0	0%	0	0%	14	1%
Military	200	46%	150	53%	64	58%	14	30%	428	49%
Neither	231	53%	126	44%	46	42%	33	70%	436	50%
Gear Types:										
Spinners	238	57%	106	39%	33	31%	13	30%	390	46%
Bait	0	0%	12	4%	14	13%	4	9%	30	4%
Jigs	0	0%	7	3%	3	3%	1	2%	11	1%
Flies	178	43%	148	54%	58	53%	26	59%	410	49%

<sup>1</sup> Angler interviews from April 25 thru May 31, 1987.

Table 49. Opinions of anglers interviewed at Piledriver Slough rainbow trout and grayling fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	40	9.7%	1.5%
	Good (2)	218	52.8%	2.5%
	Fair (3)	90	21.8%	2.0%
	Poor (4)	65	15.7%	1.8%
	Total	413		
	Mean Rating = 2.44			
2. What is your opinion of the stocking of rainbow trout at Piledriver Slough?	Approve	560	95.2%	0.9%
	Disapprove	13	2.2%	0.6%
	No Opinion	15	2.6%	0.8%
	Total	588		
3. What is your opinion of a 12 inch minimum length limit for Arctic grayling?	Approve	493	83.7%	1.5%
	Disapprove	59	10.0%	1.2%
	No Opinion	37	6.3%	1.0%
	Total	589		
4. What is your opinion of a no-bait restriction at Piledriver Slough?	Approve	423	72.1%	1.9%
	Disapprove	114	19.4%	1.6%
	No Opinion	50	8.5%	1.2%
	Total	587		

## CHAPTER 9 - QUARTZ LAKE RAINBOW TROUT AND COHO SALMON FISHERY

### Introduction

Quartz Lake is a 608 ha lake located 27 km north of Delta Junction near the Richardson Highway. There is one access road to the lake from the Richardson Highway. The State maintains a boat launch and campground at the lake. Lands surrounding the southern half of the lake comprise a State Recreation Area. The northern shoreline is privately owned and contains a dozen cabins and one commercial lodge.

The lake was chemically rehabilitated in 1970 to eliminate a stunted northern pike population and least cisco. Since 1970, hatchery raised rainbow trout and coho salmon have been stocked. The lake sustains both a summer and winter fishery for rainbow trout and landlocked coho salmon. Creel censuses have been conducted on the lake since 1972. For the period 1978-1986, annual angler effort averaged 13,119 angler-days and harvests averaged 27,042 coho salmon and 4,466 rainbow trout (Mills 1979-1987). A summer creel census was conducted on Quartz Lake in 1986 (Clark and Ridder 1987). Estimated angler effort was 27,008 hours. Estimated harvest of rainbow trout and coho salmon was 8,088 and 7,906, respectively. Harvested rainbow trout ranged from 105 mm to 460 mm and coho salmon ranged from 100 mm to 346 mm. The summer creel census was again conducted during 1987.

The creel census provides estimates of CPUE, HPUE, catch, harvest, angler effort, and catch composition. These estimates will be added to a long term database and will be used to assist in setting stocking levels and to determine types and strains of fish to be stocked.

### Methods

Access to Quartz Lake is limited to a single road leading from the Richardson Highway to a State boat launch and campground facility. Both shore and boat anglers use the area. The creel census was conducted from ice breakup (mid May) through 31 August. This creel census is a stationary harvest survey.

The fishing day is considered to be from 0600 hours to 2400 hours. Each day is divided into two strata: (1) weekdays 0600 to 2400 hours and (2) weekends and holidays 0600 to 2400 hours. Sampling effort is allocated 67% and 33% to strata 1 and 2, respectively. Each month, 5 weekend and 10 weekday samples are randomly selected for sampling.

Counts of anglers are made at randomly selected times within each hour of a sample period. The entire lake can be viewed from the boat launch area. During the remainder of each hour, the creel clerk interviews anglers leaving the fishery. The majority of angler interviews are from anglers who have completed their trip.

### Results and Discussion

The Quartz Lake creel census was conducted from 1 May through 31 August 1987. A total of 502 anglers were interviewed (Table 50). During the creel census,

178 angler counts were made. Angler effort was estimated at 35,670 hours. Estimated CPUE and HPUE of rainbow trout was 0.28 and 0.16, respectively. Both rainbow trout CPUE and HPUE peaked in the month of May. A total of 10,124 rainbow were caught with 5,738 rainbow trout being harvested. Over 50% of the rainbow trout were caught and harvested during the month of May. Estimated coho salmon CPUE and HPUE were 1.15 and 0.52, respectively. The estimated catch of coho salmon was 40,977 and the estimated harvest was 18,655. The majority of coho salmon were caught (42%) and harvested (50%) during the month of July.

The majority of anglers interviewed caught (74%) or harvested (79%) zero rainbow trout (Table 51). Of the anglers who caught rainbow trout, 78% of the catch and 100% of the harvest was accounted for by anglers who caught 10 or fewer fish. On the other hand, a much smaller number of anglers caught (45%) or harvested (60%) zero coho salmon (Table 52). Also, only 54% of the catch was accounted for by anglers who caught 10 or fewer coho salmon.

Relative stock densities of both rainbow trout and coho salmon were estimated from harvest samples at Quartz Lake. The rainbow trout were fairly evenly distributed between preferred size (42%) and memorable size (41%) (Table 53). Only 3% were stock size and 1% trophy size. On the other hand, no coho salmon were in the memorable and trophy size categories and 35% were stock size, 61% quality size, and 3% preferred size.

A demographic profile of anglers interviewed at Quartz Lake shows that the majority of anglers are male (78%), adult (83%), reside in the State of Alaska, and are not from the Delta Junction area (67%) (Table 54). Of the anglers interviewed, 15% were military and 8% were tourists. The majority of anglers used bait (51%) as their terminal gear type with 38% using spinners. Anglers gave the fishery a mean rating of 2.82; a fair to good rating (Table 55). Of these anglers, only 7% gave the fishery an excellent rating while approximately 30% gave the ratings of good, fair, and poor. Seventy-six percent knew the bag limit. Eighty-seven percent said public boat access was adequate. Finally, the anglers were asked what species they would like stocked at Quartz Lake. Over 74% had no opinion while a majority of the rest were split between northern pike (6%), walleye pike (6%), and lake trout (4%).

Table 50. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of rainbow trout and coho salmon at Quartz Lake, 1987.

Strata	Angler Effort			n <sup>2</sup>	CPUE		HPUE		Catch		Harvest	
	n <sup>1</sup>	Hours	SE		Mean	SE	Mean	SE	Total	SE	Total	SE
<u>Rainbow Trout</u>												
May 1 - May 31	46	9,818	738	126	0.55	0.10	0.37	0.07	5,445	2,090	3,645	1,394
Jun 1 - Jun 30	42	8,169	703	129	0.29	0.18	0.05	0.02	2,350	1,330	402	216
Jul 1 - Jul 31	39	11,239	1,910	108	0.13	0.04	0.10	0.04	1,443	1,615	1,098	1,282
Aug 1 - Aug 31	51	6,443	783	139	0.14	0.06	0.09	0.04	887	562	592	370
May 1 - Aug 31	178	35,670	2,302	502	0.28	0.11	0.16	0.05	10,124	3,010	5,738	1,942
<u>Coho Salmon</u> <sup>3</sup>												
May 1 - May 31	46	9,818	738	126	0.82	0.17	0.25	0.07	8,003	3,083	2,441	989
Jun 1 - Jun 30	42	8,169	703	129	1.06	0.17	0.53	0.09	8,685	3,336	4,304	1,651
Jul 1 - Jul 31	39	11,239	1,910	108	1.53	0.21	0.83	0.14	17,249	15,786	9,353	8,933
Aug 1 - Aug 31	51	6,443	783	139	1.09	0.20	0.40	0.11	7,040	4,548	2,568	1,590
May 1 - Aug 31	178	35,670	2,302	502	1.15	0.19	0.52	0.11	40,977	17,045	18,665	9,275

<sup>1</sup> Number of instantaneous angler counts.

<sup>2</sup> Number of angler interviews (complete and incomplete trips).

<sup>3</sup> Landlocked coho salmon.

Table 51. Distribution of rainbow trout catch and harvest among anglers interviewed at the Quartz Lake rainbow trout and coho salmon fishery, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	341	74%	74%	0	0%	0%	365	79%	79%	0	0%	0%
1	40	9%	83%	40	9%	9%	48	10%	90%	48	22%	22%
2	27	6%	89%	54	12%	21%	18	4%	93%	36	16%	38%
3	9	2%	90%	27	6%	27%	6	1%	95%	18	8%	46%
4	11	2%	93%	44	10%	36%	13	3%	98%	52	23%	69%
5	8	2%	95%	40	9%	45%	4	1%	98%	20	9%	78%
6	6	1%	96%	36	8%	53%	5	1%	100%	30	14%	92%
7	7	2%	97%	49	11%	64%	0	0%	100%	0	0%	92%
8	3	1%	98%	24	5%	69%	0	0%	100%	0	0%	92%
9	2	0%	98%	18	4%	73%	2	0%	100%	18	8%	100%
10	2	0%	99%	20	4%	78%	0	0%	100%	0	0%	100%
12	1	0%	99%	12	3%	80%						
14	1	0%	99%	14	3%	83%						
15	2	0%	100%	30	7%	90%						
45	1	0%	100%	45	10%	100%						
Total	461			453			461			222		

<sup>1</sup> Number of anglers interviewed that caught or harvested a certain number of rainbow trout.

<sup>2</sup> Number of rainbow trout caught or harvested by that group of anglers.

Table 52. Distribution of coho salmon catch and harvest among anglers interviewed at the Quartz Lake rainbow trout and coho salmon fishery, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	206	45%	45%	0	0%	0%	278	60%	60%	0	0%	0%
1	40	9%	53%	40	2%	2%	46	10%	70%	46	6%	6%
2	34	7%	61%	68	4%	6%	34	7%	78%	68	10%	16%
3	20	4%	65%	60	4%	10%	30	7%	84%	90	13%	29%
4	17	4%	69%	68	4%	14%	16	3%	88%	64	9%	38%
5	27	6%	75%	135	8%	22%	10	2%	90%	50	7%	45%
6	20	4%	79%	120	7%	29%	8	2%	92%	48	7%	51%
7	9	2%	81%	63	4%	33%	8	2%	93%	56	8%	59%
8	10	2%	83%	80	5%	38%	9	2%	95%	72	10%	69%
9	14	3%	86%	126	7%	45%	3	1%	96%	27	4%	73%
10	15	3%	89%	150	9%	54%	19	4%	100%	190	27%	100%
11	7	2%	91%	77	5%	59%						
12	7	2%	92%	84	5%	64%						
13	11	2%	95%	143	8%	72%						
14	4	1%	96%	56	3%	75%						
15	5	1%	97%	75	4%	80%						
16	3	1%	97%	48	3%	83%						
18	1	0%	98%	18	1%	84%						
20	3	1%	98%	60	4%	87%						
21	1	0%	98%	21	1%	88%						
25	1	0%	99%	25	1%	90%						
26	2	0%	99%	52	3%	93%						
27	1	0%	99%	27	2%	95%						
28	1	0%	100%	28	2%	96%						
30	1	0%	100%	30	2%	98%						
32	1	0%	100%	32	2%	100%						
Total	461			1,686			461			711		

<sup>1</sup> Number of anglers interviewed that caught or harvested a certain number of coho salmon.

<sup>2</sup> Number of coho salmon caught or harvested by that group of anglers.

Table 53. Relative stock densities (RSD) of rainbow trout and coho salmon from harvest samples at Quartz Lake, 1987.

Category	Range <sup>1</sup>	n	%	SE
<u>Rainbow Trout</u>				
Stock	180-224	6	3.2%	1.3%
Quality	225-299	26	13.7%	2.5%
Preferred	300-374	79	41.6%	3.6%
Memorable	375-449	77	40.5%	3.6%
Trophy	450-above	2	1.1%	0.7%
Total		190		
<u>Coho Salmon</u>				
Stock	140-229	237	36.5%	1.9%
Quality	230-299	395	60.9%	1.9%
Preferred	300-379	17	2.6%	0.6%
Memorable	380-459	0	0.0%	—
Trophy	460-above	0	0.0%	—
Total		649		

<sup>1</sup> Range is fork length range for each RSD category in mm.

Table 54. Demographic profiles of anglers interviewed at the Quartz Lake rainbow trout and coho salmon fishery, 1987.

Angler Characteristic	May		June		July		August		Total	
	n	%	n	%	n	%	n	%	n	%
Total Number of Interviews	166	—	138	—	112	—	153	—	569	—
Male	103	82%	103	80%	78	72%	107	76%	391	78%
Female	23	18%	25	20%	30	28%	33	24%	111	22%
Adult	112	90%	109	86%	88	81%	105	75%	414	83%
Youth	12	10%	18	14%	20	19%	35	25%	85	17%
Resident	78	98%	98	82%	94	87%	119	85%	389	87%
Non-resident	2	3%	22	18%	14	13%	21	15%	59	13%
Local	15	19%	104	88%	18	17%	10	7%	147	33%
Non-local	63	81%	14	12%	89	83%	127	93%	293	67%
Tourist	1	1%	20	14%	12	11%	12	8%	45	8%
Military	39	23%	19	14%	7	6%	21	14%	86	15%
Neither	126	76%	99	72%	93	83%	120	78%	438	77%
Gear Types:										
Spinners	53	45%	69	54%	32	30%	27	21%	181	38%
Bait	54	46%	36	28%	60	56%	94	75%	244	51%
Jigs	0	0%	6	5%	2	2%	3	2%	11	2%
Trolling	0	0%	13	10%	4	4%	0	0%	17	4%
Flies	10	9%	3	2%	10	9%	2	2%	25	5%

Table 55. Opinions of anglers interviewed at the Quartz Lake rainbow trout and coho salmon fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	38	7.7%	1.2%
	Good (2)	159	32.1%	2.1%
	Fair (3)	154	31.1%	2.1%
	Poor (4)	144	29.1%	2.0%
	Total	495		
	Mean Rating = 2.82			
2. Do you know the bag limit for rainbow trout and coho salmon?	Yes	373	76.0%	1.9%
	No	118	24.0%	1.9%
	Total	491		
3. Is public boat access adequate?	Yes	336	87.0%	1.7%
	No	18	4.7%	1.1%
	No Opinion	32	8.3%	1.4%
	Total	386		
4. What other species would you like to see stocked in the interior lakes?	Northern Pike	32	6.3%	1.1%
	Walleye Pike	31	6.2%	1.1%
	King Salmon	12	2.4%	0.7%
	Lake Trout	22	4.4%	0.9%
	Arctic char/ Dolly Varden	3	0.6%	0.3%
	Burbot	8	1.6%	0.6%
	Warmwater Fish	3	0.6%	0.3%
	Other Trout/Char	6	1.2%	0.5%
	Sheefish	4	0.8%	0.4%
	Grayling	6	1.2%	0.5%
	Other Fish	3	0.6%	0.3%
	No Opinion	374	74.2%	1.9%
	Total	504		

## CHAPTER 10 - SALCHA RIVER GRAYLING FISHERY

### Introduction

The Salcha River is located about 67 km east of Fairbanks on the Richardson Highway (Figure 8). One access point is provided at a State Boat Launch Facility where the Richardson Highway crosses the river. The Salcha River supports a popular Arctic grayling fishery. Numerous private cabins are located along the Salcha River. The majority of the angling effort occurs on the upper part of the river above the boat launch facility. From 1977 to 1986, Arctic grayling harvest has ranged from 3,983 to 13,305 fish, with an annual average of 7,392 (Mills 1979-1987).

Very little research has been conducted on the Salcha River Arctic grayling population. For this reason, a creel census was conducted in 1987 to provide baseline information about the fishery.

### Methods

All anglers enter the fishery at the State campground and boat launch facility (Figure 8). To effectively use the creel clerk's time, the Salcha River Arctic grayling creel census is conducted in conjunction with the Piledriver Slough CPUE survey. The creel census is a stationary CPUE survey that is conducted from mid May to the end of August.

The fishing day is defined to occur from 0800 to 2200 hours. The fishery is divided into two strata: (1) weekdays 0800 to 2200 hours and (2) weekends and holidays 0800 to 2200 hours. Allocation of sampling periods is the same as for Piledriver Slough: 60% to stratum 1 and 40% to stratum 2. The sample period for this CPUE survey is 2 hours.

Each sample period is determined by randomly selecting either the time period before or after the sample period chosen for Piledriver Slough. The creel clerk spends 2 hours at the boat launch and campground conducting angler interviews and sampling the harvest.

### Results and Discussion

The Salcha River Arctic grayling creel census was conducted from 15 May through 31 August 1987. A total of 152 anglers were interviewed (Table 56). Of these, 140 were complete trip angler interviews. CPUE was estimated to be 1.27 fish per hour and HPUE was estimated to be 0.66 fish per hour.

The majority of anglers were male (74%), adult (75%), residents of the State of Alaska (95%), and from the Fairbanks area (94%) (Table 57). Four percent of the anglers interviewed were tourists and 3% were military. Seventy percent of the anglers used spinners as their terminal fishing gear type. Anglers interviewed gave the fishery a mean rating of 2.51; a fair to good rating (Table 58). These same anglers were asked to compare current fishing with fishing in prior years at the Salcha River. Only 2% said it was better while 50% said it was the same, 34% said it was worse and 14% had no opinion.

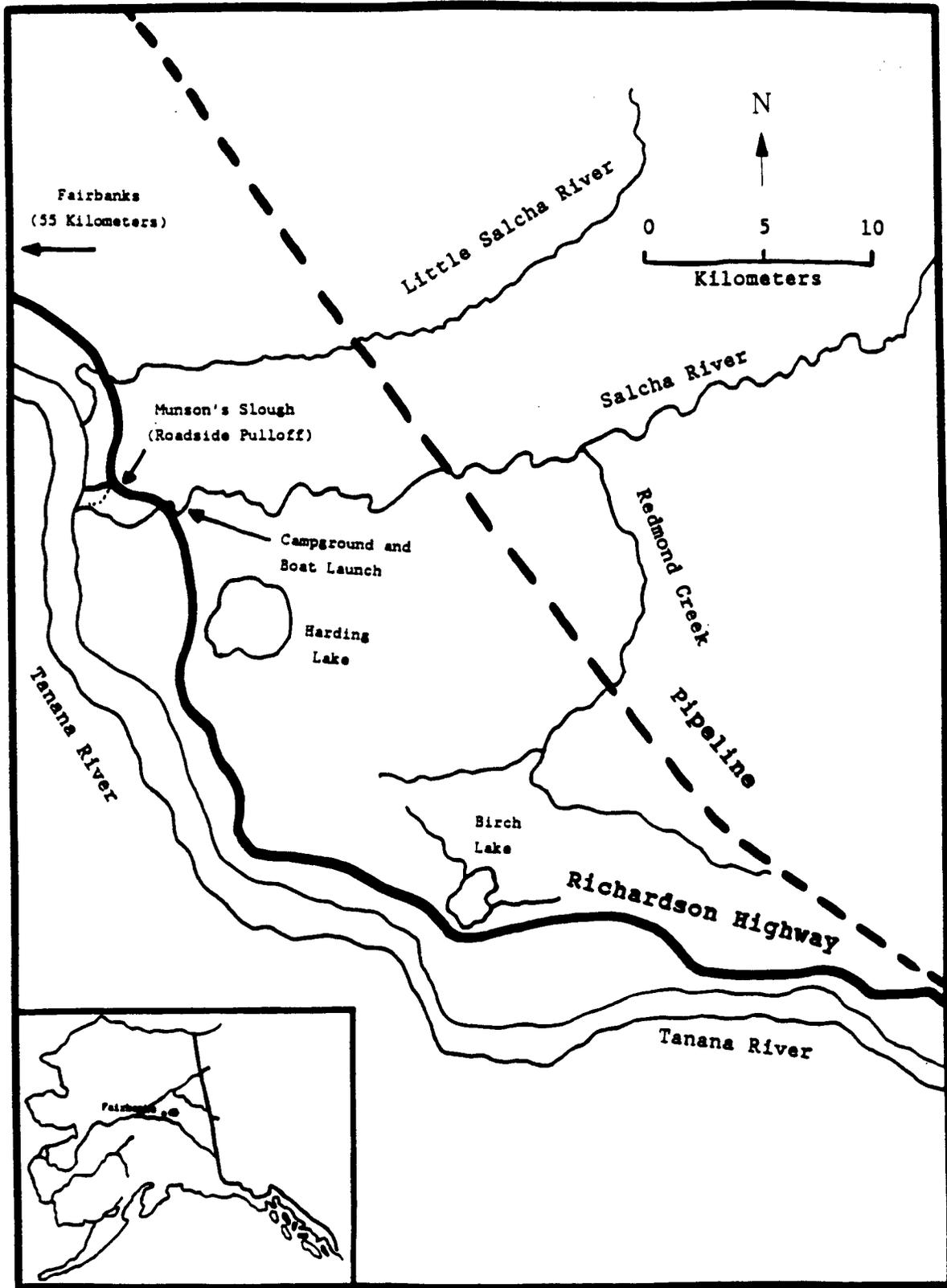


Figure 8. Location of Salcha River Arctic grayling fishery, and chinook and chum salmon fishery, Tanana River drainage, Alaska.

Table 56. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of Arctic grayling at the Salcha River, 1987.

Strata	Angler Interviews		CPUE		HPUE	
	C <sup>1</sup>	I <sup>2</sup>	Mean	SE	Mean	SE
May 15 - May 31						
Weekdays (0800-2200)	1	3	1.53	1.00	1.53	1.00
Weekends (0800-2200)	22	0	2.36	0.49	1.03	0.34
Jun 1 - Jun 30						
Weekdays (0800-2200)	21	9	2.46	1.73	0.28	0.08
Weekends (0800-2200)	44	0	1.01	0.27	0.50	0.06
Jul 1 - Jul 31						
Weekdays (0800-2200)	3	0	1.19	0.15	0.51	0.04
Weekends (0800-2200)	11	0	0.21	0.13	0.21	0.13
Aug 1 - Aug 31						
Weekdays (0800-2200)	2	0	0.67	0.33	0.67	0.33
Weekends (0800-2200)	36	0	0.73	0.16	0.58	0.16
Jun 15 - Aug 31	140	12	1.27	0.75	0.66	0.40

<sup>1</sup> Number of complete trip angler interviews that targeted lake trout.

<sup>2</sup> Number of incomplete trip angler interviews that targeted lake trout.

Table 57. Demographic profile of anglers interviewed at the Salcha River Arctic grayling fishery, 1987.

Angler Characteristic	n	%	SE	Angler Characteristic	n	%	SE
Total Number of Interviews	156	—	—	Local	129	94%	2.0%
				Non-local	8	6%	2.0%
Male	112	74%	3.6%	Tourist	7	4%	1.6%
Female	40	26%	3.6%	Military	5	3%	1.4%
Adult	106	75%	3.5%	Neither	144	93%	2.0%
Youth	36	25%	3.5%	Gear Type:			
Resident	130	95%	1.9%	Spinners	103	70%	3.8%
Non-resident	7	5%	1.9%	Bait	4	3%	1.4%
				Jigs	2	1%	0.8%
				Flies	39	26%	3.6%

Table 58. Opinions of anglers interviewed at the Salcha River Arctic grayling fishery, 1987.

Question	Opinion	n	%	se
1. How would you rate the fishing here this year?	Excellent (1)	5	9%	3.9%
	Good (2)	31	56%	6.7%
	Fair (3)	5	9%	3.9%
	Poor (4)	14	26%	5.9%
	Total	55		
	Mean Rating = 2.51			
2. How does the quality of fishing compare to fishing in prior years?	Better	1	2%	1.8%
	Same	29	50%	6.6%
	Worse	20	34%	6.2%
	No Opinion	8	14%	4.6%
	Total	58		

## CHAPTER 11 - SALCHA RIVER CHINOOK AND CHUM SALMON FISHERY

### Introduction

The Salcha River is located about 67 km east of Fairbanks on the Richardson Highway (Figure 8). The Salcha River supports a popular chinook and chum salmon recreational fishery. The chinook salmon run in the Salcha River is the largest documented run in the middle Yukon River drainage (Barton 1985). From 1977 to 1986, sport harvest chinook salmon in the Salcha River has ranged from 27 to 809, annually averaging 278 (Mills 1978-1987). Angler effort appears to be increasing. Chum salmon also run up the Salcha River during the later part of July. The chum salmon are not as important to recreational anglers but still provide increased angler opportunities. Fishing for salmon is allowed on the lower 14 mi of the river. The goal of this creel census is to develop a database to monitor the effects of fishing on this important fishery.

### Methods

Two major access areas are available to Salcha river chinook and chum salmon anglers (Figure 8). All anglers using boats launch at the State boat launch facility where the Richardson Highway crosses the Salcha River. Most shore based anglers walk to the river from a parking area at the Richardson Highway pulloff located 1 mile west of the river at Munson's Slough. About equal amounts of fishing effort are expended by boat and shore anglers.

The creel census is a roving harvest survey conducted during the month of July. The fishery is stratified into weekend and weekday strata. The fishing day occurs from 0600 to 2400 hours. A sample period is 3 hours. Ten periods are sampled each week.

An angler count is conducted at a randomly selected time each hour of the sample period. The rest of the hour is used to perform angler interviews. A river boat is used to make angler counts between the access point (boat launch facility) and the mouth of the Salcha River. Angler counts take about 10 minutes to conduct. The creel clerk's time is then split between the boat launch area and the shore angler's pulloff area. The creel clerk conducts completed trip angler interviews.

### Results and Discussion

The Salcha River creel census was conducted from 1 July through 28 July 1987. On 29 July 1987, the chinook and chum fishery was closed due to low escapement estimates. A total of 81 angler counts were made (Table 59). Estimated angler effort was 8,017 hours. Thirty-two percent of the angler effort was expended from 13 July through 17 July. Two hundred six complete trip angler interviews were conducted during the creel census. Estimated CPUE for chinook salmon was 0.017 fish per hour and estimated HPUE was 0.015 fish per hour. The estimated catch and harvest were 130 with 111 chinook salmon, respectively. Almost 50% of the catch and harvest occurred from 20 July through 24 July. Estimated CPUE and HPUE for chum salmon was 0.037 and 0.016, respectively. The catch and harvest of chum salmon was 272 and 120,

respectively. Over 97% of the chum salmon catch and harvest occurred from 20 July through 24 July.

Relative stock densities were estimated from the harvest samples of chinook and chum salmon. No chinook salmon were in the stock and quality size categories while 41% were preferred size, 56% were memorable size, and 3% trophy size (Table 60). Estimated chum salmon RSD were 36% and 64% of preferred and memorable size. No chum salmon were of stock, quality, or trophy sizes.

The majority of anglers interviewed were male (93%), adult (95%), residents of the State of Alaska (94%), from the Fairbanks area (93%), military (59%), and used spinners as their terminal angling gear type (91%) (Table 61). These same anglers gave the fishery a mean rating of 3.40, or fair to poor rating (Table 62). Ninety-seven percent of the anglers knew the bag limit for salmon and said public boat access was adequate. The majority of anglers approved of reduced seasons and fishing closures as means of managing the fishery (79%). Also, 87% approved of the stocking of chinook salmon in the Salcha River.

Table 59. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of chinook and chum salmon at the Salcha River, 1987.

Strata	Angler Effort		Angler Interviews			CPUE		HPUE		Catch		Harvest	
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Mean	SE	Total	SE	Total	SE
<u>Chinook Salmon</u>													
Jul 1 - Jul 3	3	54	0	0	0	—	—	—	—	—	—	—	—
Jul 4 - Jul 5	9	32	45	0	0	—	—	—	—	—	—	—	—
Jul 6 - Jul 10	15	1,278	1,192	36	0	0.000	0.000	0.000	0.000	0	0	0	0
Jul 11 - Jul 12	12	993	667	26	0	0.044	0.022	0.033	0.019	44	34	33	26
Jul 13 - Jul 17	10	2,583	1,138	51	0	0.006	0.006	0.006	0.006	15	14	15	14
Jul 18 - Jul 19	12	753	328	28	0	0.010	0.010	0.010	0.010	8	7	8	7
Jul 20 - Jul 24	12	1,530	791	54	0	0.042	0.012	0.037	0.011	64	37	56	33
Jul 25 - Jul 26	3	492	53	0	0	—	—	—	—	—	—	—	—
Jul 27 - Jul 28	5	302	102	11	0	0.000	0.000	0.000	0.000	0	0	0	0
Jul 1 - Jul 28	81	8,017	571	206	0	0.017	0.011	0.015	0.010	130	52	111	45
<u>Chum Salmon</u>													
Jul 1 - Jul 3	3	54	0	0	0	—	—	—	—	—	—	—	—
Jul 4 - Jul 5	9	32	45	0	0	—	—	—	—	—	—	—	—
Jul 6 - Jul 10	15	1,278	1,192	36	0	0.000	0.000	0.000	0.000	0	0	0	0
Jul 11 - Jul 12	12	993	667	26	0	0.000	0.000	0.000	0.000	0	0	0	0
Jul 13 - Jul 17	10	2,583	1,138	51	0	0.000	0.000	0.000	0.000	0	0	0	0
Jul 18 - Jul 19	12	753	328	28	0	0.010	0.010	0.010	0.010	8	7	8	7
Jul 20 - Jul 24	12	1,530	791	54	0	0.173	0.054	0.073	0.020	264	154	112	64
Jul 25 - Jul 26	3	492	53	0	0	—	—	—	—	—	—	—	—
Jul 27 - Jul 28	5	302	102	11	0	0.000	0.000	0.000	0.000	0	0	0	0
Jul 1 - Jul 28	81	8,017	571	206	0	0.037	0.025	0.016	0.010	272	154	120	64

<sup>1</sup> Number of instantaneous hourly angler counts.

<sup>2</sup> Number of completed trip angler interviews.

<sup>3</sup> Number of incompleted trip angler interviews.

Table 60. Relative stock density (RSD) of chinook and chum salmon from harvest samples at the Salcha River, 1987.

Category	Range <sup>1</sup>	n	%	SE
<u>Chinook Salmon</u>				
Stock	250-459	0	0%	—
Quality	460-569	0	0%	—
Preferred	570-749	11	41%	9.5%
Memorable	750-939	15	56%	9.6%
Trophy	940-above	1	3%	3.3%
Total		27		
<u>Chum Salmon</u>				
Stock	250-459	0	0%	—
Quality	460-569	0	0%	—
Preferred	570-749	4	36%	14.5%
Memorable	750-939	7	64%	14.5%
Trophy	940-above	0	0%	—
Total		11		

<sup>1</sup> Range is the fork length range of the RSD category in mm.

Table 61. Demographic profile of anglers interviewed at the Salcha River chinook and chum salmon fishery, 1987.

Angler Characteristic	n	%	SE	Angler Characteristic	n	%	SE
Total Number of Interviews	232	—	—	Local	208	93%	1.7%
				Non-local	16	7%	1.7%
Male	212	93%	1.7%	Tourist	8	3%	1.1%
Female	15	7%	1.7%	Military	138	59%	3.3%
				Neither	86	38%	3.2%
Adult	219	95%	1.4%	Gear Type:			
Youth	12	5%	1.4%	Spinners	193	91%	2.0%
				Bait	16	8%	1.9%
Resident	209	94%	1.6%	Jigs	2	1%	0.7%
Non-resident	14	6%	1.6%	Flies	1	<1%	0.6%

Table 62. Opinions of anglers interviewed at the Salcha River chinook and chum salmon fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	0	0%	—
	Good (2)	2	5%	3.5%
	Fair (3)	20	50%	7.9%
	Poor (4)	18	45%	7.9%
	Total	40		
	Mean Rating = 3.40			
2. Do you know the bag limit?	Yes	187	97%	1.2%
	No	5	3%	1.2%
	Total	192		
3. Is public access adequate?	Yes	76	97%	1.9%
	No	0	0%	—
	No Opinion	2	3%	1.9%
	Total	78		
4. What is your opinion of reduced fishing seasons and emergency fishing closures as means to manage this fishery?	Approve	103	79%	3.6%
	Disapprove	10	7%	2.2%
	No Opinion	18	14%	3.0%
	Total	131		
5. What is your opinion of stocking chinook salmon in the Salcha River?	Approve	111	87%	3.0%
	Disapprove	2	2%	1.2%
	No Opinion	15	11%	2.8%
	Total	128		

## CHAPTER 12 - SUMMIT LAKE LAKE TROUT FISHERY

### Introduction

Summit Lake is located at the headwaters of the Gulkana River drainage approximately 112 km south of Delta Junction on the Richardson Highway (Figure 9). Summit Lake has a surface area of 1,650 ha. A boat launch facility is maintained at Summit Lake lodge. There are also numerous roadside access areas along the Richardson Highway. Summit Lake supports a popular lake trout fishery. Some burbot and Arctic grayling are also harvested from Summit Lake. In 1986, 1,538 angler-days were spent to harvest 428 lake trout, 484 Arctic grayling, and 24 burbot (Mills 1987). In 1987, low population abundance prompted ADFG to close burbot fishing until 31 December 1987. Also, the bag limit of lake trout was reduced to two fish per day, with an 18 inch minimum length limit. During 1986, an impromptu creel census was conducted to gather lake trout harvest samples. This creel census was expanded in 1987 to improve the data base of CPUE, HPUE, and harvest composition of lake trout in Summit Lake.

### Methods

Access to Summit Lake is generally limited to a boat launch facility at Summit Lake Lodge and numerous roadside access areas along the Richardson Highway (Figure 9). Both boat and shore anglers use these areas. This creel census is a roving CPUE survey. The CPUE survey is conducted from 15 June (ice breakup) and 31 August.

The fishing day is considered to be from 0800 to 2400 hours. Each month is divided into two strata: (1) weekdays 0800 to 2400 hours and (2) weekends and holidays 0800 to 2400 hours. Allocation of sampling effort is 60% and 40% to strata 1 and 2, respectively. Each month, four weekday and eight weekend strata are randomly chosen for sampling. A sample period is 4 hours. Anglers are contacted as they leave the fishery at the various access points along the lake. Creel clerks conduct mostly complete trip angler interviews.

### Results and Discussion

The Summit Lake creel census was conducted from 15 June through 31 August 1987. Seventy-six anglers were interviewed (Table 63). Seventy of the interviews were from anglers who had completed their trip. CPUE of lake trout was 0.251 fish per hour while HPUE was 0.126 fish per hour.

A concurrent study was conducted at Summit Lake to assess the biological characteristics of lake trout (Burr 1988). Because sample sizes were so small, all biological data that were collected from lake trout during the creel census were provided to the other lake trout project and are summarized in another data series report (Burr 1988).

The majority of the anglers interviewed were male (72%), adult (95%), residents of the State of Alaska (97%), do not live in the Summit Lake area (100%), and use spinners as their terminal fishing gear (68%) (Table 64). One percent of the anglers interviewed were tourists and 12% were military.

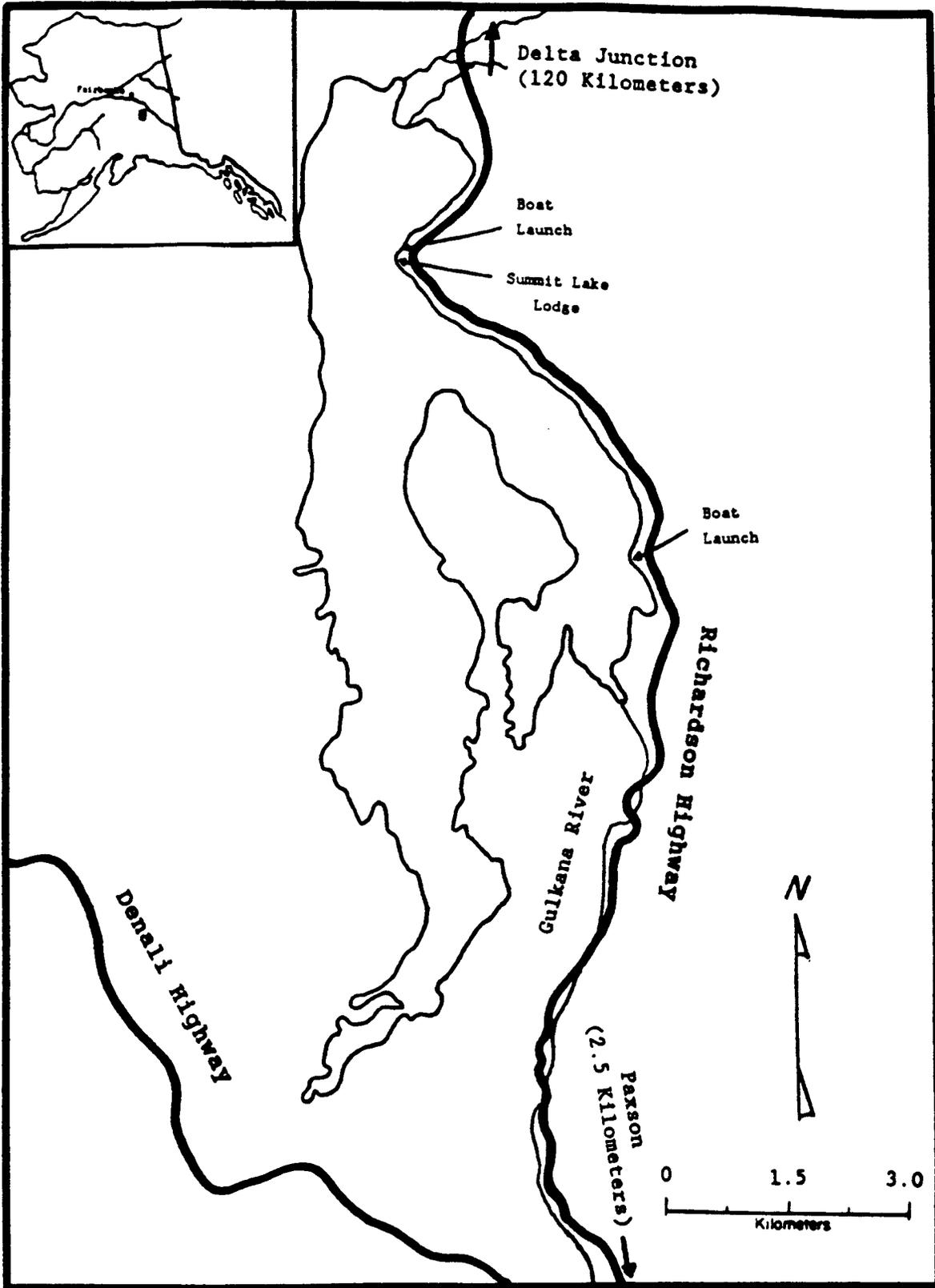


Figure 9. Location of Summit Lake, Copper River drainage, Alaska.

Anglers interviewed gave the fishery a mean rating of 3.14, or a fair rating (Table 65). No anglers rated the fishery as excellent, while 12% rated it as good, 56% as fair, and 32% as poor. Most anglers interviewed had no opinion (81%) when comparing current fishing to fishing in prior years. Sixty-eight percent of the anglers said public boat access was adequate. Only 41% of the anglers approved of an 18 inch minimum length limit for lake trout. Sixty-four percent of anglers approved of a two lake daily bag and possession limit.

Table 63. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of lake trout at Summit Lake, 1987.

Strata	Angler Interviews		CPUE		HPUE	
	C <sup>1</sup>	I <sup>2</sup>	Mean	SE	Mean	SE
Jun 15 - Jun 30						
Weekdays (0800-2400)	6	0	0.533	0.211	0.116	0.043
Weekends (0800-2400)	20	2	0.038	0.022	0.010	0.010
Jul 1 - Jul 31						
Weekdays (0800-2400)	9	3	0.038	0.029	0.000	0.000
Weekends (0800-2400)	29	1	0.349	0.197	0.136	0.031
Aug 1 - Aug 31						
Weekdays (0800-2400)	0	0	—	—	—	—
Weekends (0800-2400)	6	0	0.233	0.238	0.000	0.000
Jun 15 - Aug 31	70	6	0.251	0.200	0.126	0.080

<sup>1</sup> Number of complete trip angler interviews that targeted lake trout.

<sup>2</sup> Number of incomplete trip angler interviews that targeted lake trout

Table 64. Demographic profile of anglers interviewed at the Summit Lake lake trout fishery, 1987.

Angler			Angler				
Characteristic	n	%	SE	Characteristic	n	%	SE
Total Number of Angler Interviews	76	—	—	Local	0	0%	—
				Non-local	53	100%	—
Male	54	72%	5.2%	Military	1	1%	1.1%
Female	21	28%	5.2%	Tourist	9	12%	3.8%
				Neither	66	87%	3.9%
Adult	71	95%	2.5%	Gear Types:			
Youth	4	5%	2.5%	Spinners	41	68%	6.0%
				Bait	12	20%	5.1%
Resident	73	97%	2.0%	Trolling	7	12%	4.2%
Non-resident	2	3%	2.0%				

Table 65. Opinions of anglers interviewed at the Summit Lake lake trout fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	0	0%	—
	Good (2)	9	12%	3.7%
	Fair (3)	43	56%	5.7%
	Poor (4)	24	32%	5.4%
	Total	76		
	Mean rating = 3.14			
2. How does the quality of fishing this year compare to fishing in prior years?	Better	1	2%	1.8%
	Same	8	14%	4.5%
	Worse	2	3%	2.2%
	No Opinion	48	81%	5.1%
	Total	59		
3. Is public boat access adequate?	Yes	41	68%	3.6%
	No	12	20%	5.2%
	No Opinion	7	12%	4.2%
	Total	60		
4. What is your opinion of a 18 inch minimum length limit for lake trout?	Approve	25	41%	6.3%
	Disapprove	22	36%	6.2%
	No Opinion	14	23%	5.4%
	Total	61		
5. What is your opinion of a daily bag and possession limit of two lake trout?	Approve	39	64%	6.2%
	Disapprove	9	15%	4.6%
	No Opinion	13	21%	5.2%
	Total	61		

## CHAPTER 13 - TANGLE LAKES GRAYLING FISHERY

### Introduction

The Tangle Lakes system is a lake-river system approximately 33 km long. It includes five named lakes and 117 km of tributary streams (Figure 10). The Denali Highway bisects the system between Upper Tangle and Round Tangle lakes. There are Bureau of Land Management campgrounds adjacent to the river at both lakes next to the highway. Round Tangle Lake is the start of a popular 67 km long float trip of the Delta River (a National Wild and Scenic River).

The Tangle Lakes system has supported popular fisheries for Arctic grayling, lake trout, and burbot since the construction of the Denali Highway in the 1950's. The heaviest angling pressure occurs on Upper and Round Tangle lakes and the interconnecting Tangle River. Creel census programs were conducted in 1968, 1973, 1976, 1985, and 1986 (Roguski and Winslow 1969, Peckham 1974 and 1977, Holmes et al. 1986, and Clark and Ridder 1987). Since 1978, an average of 6,329 angler-days have been expended annually to harvest 5,962 Arctic grayling, 988 lake trout, 189 whitefish, and 109 burbot (Mills 1979-1987). Concern for the burbot and lake trout stocks prompted ADFG to close the Tangle Lakes system by emergency order to the possession of these two species. The goal of this creel census is to develop a long term data base of CPUE, HPUE, catch, harvest, harvest sampling, and angler characteristics for this important mixed stock fishery.

### Methods

Access to the two main lakes (Upper Tangle and Round Tangle lakes) is provided at a BLM campground at each lake (Figure 10). Both shore and boat anglers use this area. Anglers also commonly fish the short stretch of river that connects the two lakes (Tangle River). Because of the time involved, resources were not available to perform a harvest survey on both the Tangle Lakes and the interconnecting Tangle River. Therefore, the Tangle Lakes creel census was designed to estimate CPUE and HPUE at the upper and lower Tangle Lakes (CPUE survey), while estimating CPUE, HPUE, catch, and harvest at the Tangle River (harvest survey). At the same time, harvest sampling will be done for the entire system.

The creel census was slated to be conducted from 15 June through 31 August 1987. The fishing day is defined from 0800 to 2400 hours. The sample design used two strata per month: (1) weekdays 0800 to 2400 hours and (2) weekends and holidays 0800 to 2400 hours. Ten sample periods were randomly selected per month with 60% allocated to stratum 1 and 40% to stratum 2. The sample period for this creel census is 8 hours.

The Tangle Lakes system was split into three areas for this creel census: (1) Tangle Lakes upstream from the Tangle River; (2) the Tangle River; and (3) Tangle Lake downstream from the Tangle River. All areas were surveyed during the 8 hour sample period. The order of surveying the areas was randomly chosen before sampling was conducted. When one of the lake areas was sampled, the creel clerk was stationed at the access point and conducted angler interviews for 2 hours only.

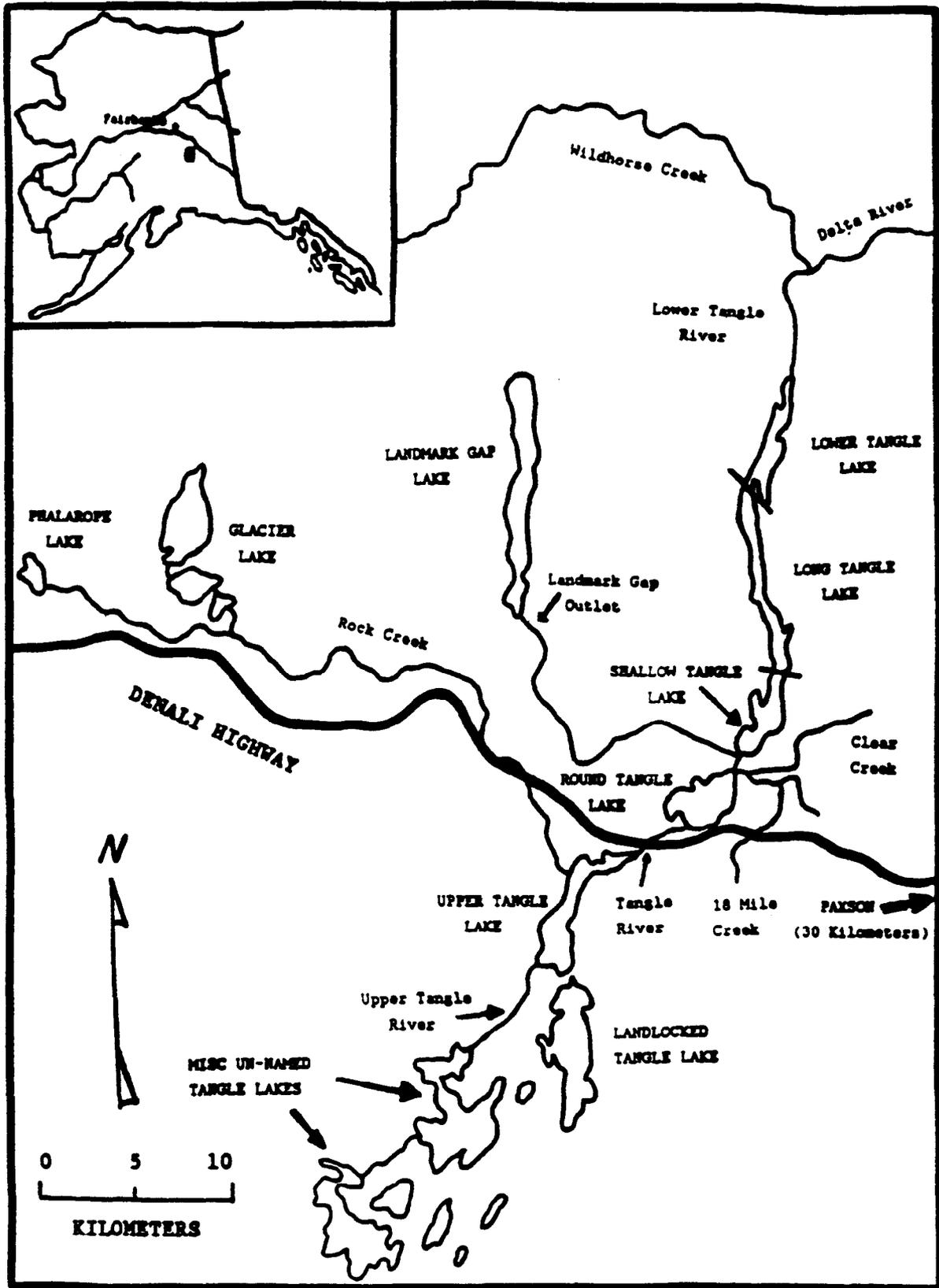


Figure 10. Location of the Tangle Lakes system, Tanana River drainage, Alaska.

When the Tangle River was sampled, angler counts were conducted at randomly chosen times in each hour of a 4 hour sample period. Angler counts do not require a boat and all anglers fishing the Tangle River can be seen from the campsite access road. Angler counts took about 10 minutes to conduct. The rest of the hour was spent conducting angler interviews. Therefore, during an 8 hour sample period, a creel clerk will spend 2 hours at each of the lake areas and 4 hours at the Tangle River.

### Results and Discussion

The creel census at the Tangle Lakes system was conducted from 15 June through 31 August 1987. A total of 99 angler counts were made (Table 66). Angler effort was estimated to be 4,129 hours at the Tangle River with 72% of the angler effort expended during July. A total of 105 anglers were interviewed at the Tangle River. Eighty-four were complete trip angler interviews. Estimated CPUE and HPUE for Arctic grayling was 2.56 and 0.412 fish per hour, respectively. Anglers caught an estimated 10,581 Arctic grayling while only harvesting 1,679. Over 60% of the Arctic grayling catch and harvest was taken in July.

At the lower and upper Tangle Lakes, 44 and 24 complete trip angler interviews were conducted, respectively (Table 67). CPUE at the lower Tangle Lake was 2.15 while CPUE was 1.35 at the upper Tangle Lake. HPUE at the lower and upper Tangle Lakes was 0.98 and 0.35 fish per hour, respectively.

Of the anglers interviewed at the Tangle River, 31% had catches of zero while 62% had harvests of zero (Table 68). Also, anglers who caught eight Arctic grayling or less accounted for 32% of the catch. However, anglers who harvested eight or fewer Arctic grayling accounted for 100% of the harvest.

Forty-two percent of anglers interviewed at the upper Tangle Lake caught no Arctic grayling and 45% harvested no Arctic grayling (Table 69). Anglers who caught or harvested three or fewer Arctic grayling accounted for 17% of the catch and 100% of the harvest. No anglers harvested more than three Arctic grayling.

Thirty-two percent of the anglers interviewed at the lower Tangle Lake caught no Arctic grayling and 48% harvested no Arctic grayling (Table 69). Anglers who caught or harvested five or fewer Arctic grayling accounted for 21% of the catch and 100% of the harvest. No anglers harvested more than five Arctic grayling.

Biological data were collected from 81 Arctic grayling harvested at the upper and lower Tangle Lakes and from 143 Arctic grayling at the Tangle River. Arctic grayling ranged in age from 3 to 7 at the Tangle Lakes and from 1 to 7 in the Tangle River (Table 70). Age 4 and 5 Arctic grayling composed 71% of the Tangle Lakes Arctic grayling harvest. Age 3 and 4 Arctic grayling made up 72% of the harvest sample at the Tangle River. The mean fork length of grayling harvested at the Tangle Lakes and Tangle River was 305 mm and 262 mm, respectively. The majority of Arctic grayling in the Tangle Lakes were quality size (66%) while the majority of Arctic grayling in the Tangle

River were almost evenly split between stock (54%) and quality size (43%) (Table 71). No Arctic grayling in the entire system was in the memorable or trophy size categories.

Demographic profiles were completed for all three lake areas (Table 72). The anglers interviewed at all three areas were mainly male (74%), adult (90%), residents of the State of Alaska (84%), and not from the Tangle Lakes area. A small number of anglers were tourists (13%) and military (4%). The majority of the anglers at the Tangle Lakes used spinners as their terminal fishing gear (94%), while anglers at Tangle River were split between spinners (41%) and flies (48%).

Opinions of anglers interviewed were compiled separately for all three lake areas (Tables 73, 74, and 75). The anglers at all three areas gave the fishing a rating of about 2.40. In all three areas, about 50% rated the fishing as good. In comparing current fishing with fishing in prior years, the majority of anglers at all three areas said fishing was worse or they expressed no opinion. The majority of anglers said public boat access is adequate. The majority of all anglers approved of a length limit for Arctic grayling in the Tangle Lakes system.

Table 66. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of Arctic grayling at the Tangle River Arctic grayling fishery, 1987.

Strata	Angler Effort		Angler Interviews		CPUE		HPUE		Catch		Harvest		
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Mean	SE	Total	SE	Total	SE
Jun 15 - Jun 30													
Weekdays	8	336	280	7	0	5.71	1.53	0.19	0.07	1,920	1,623	62	54
Weekends	12	288	229	13	2	1.88	0.26	0.76	0.17	540	4,317	220	177
Jul 1 - Jul 31													
Weekdays	20	2,373	4,535	21	4	2.04	0.74	0.43	0.13	4,842	8,922	1,009	1,859
Weekends	20	602	856	13	6	3.02	1.11	0.21	0.13	1,817	2,495	127	163
Aug 1 - Aug 31													
Weekdays	16	231	459	7	1	4.30	1.48	0.94	0.22	993	1,885	218	425
Weekends	23	299	326	23	8	1.57	0.47	0.14	0.04	469	507	43	47
Jun 15 - Aug 31													
	99	4,129	1,047	84	21	2.56	0.91	0.41	0.13	10,581	9,507	1,679	1,923

- 1 Number of instantaneous hourly angler counts.
- 2 Number of completed trip angler interviews.
- 3 Number of incompleted trip angler interviews.

Table 67. Number of angler interviews, and estimates of CPUE (catch per hour) and HPUE (harvest per hour) of Arctic grayling at the Tangle Lakes Arctic grayling fishery, 1987.

Strata	Angler Interviews		CPUE		HPUE	
	C <sup>1</sup>	I <sup>2</sup>	Mean	SE	Mean	SE
<u>Lower Tangle Lakes</u>						
Jun 15 - Jun 30						
Weekdays (0800-2400)	3	0	3.222	0.401	1.000	0.193
Weekends (0800-2400)	3	0	1.673	0.764	1.107	0.766
Jul 1 - Jul 31						
Weekdays (0800-2400)	9	0	1.242	0.533	0.286	0.102
Weekends (0800-2400)	14	0	1.935	0.772	0.287	0.153
Aug 1 - Aug 31						
Weekdays (0800-2400)	5	0	4.850	1.198	2.367	0.611
Weekends (0800-2400)	10	0	0.233	0.487	0.846	0.323
<hr/>						
Jun 15 - Aug 31	44	0	2.515	0.742	0.982	0.432
<hr/>						
<u>Upper Tangle Lakes</u>						
Jun 15 - Jun 30						
Weekdays (0800-2400)	0	0	—	—	—	—
Weekends (0800-2400)	0	0	—	—	—	—
Jul 1 - Jul 31						
Weekdays (0800-2400)	6	0	2.562	1.289	0.347	0.139
Weekends (0800-2400)	7	0	0.500	0.197	0.250	0.095
Aug 1 - Aug 31						
Weekdays (0800-2400)	3	0	1.722	0.056	0.444	0.309
Weekends (0800-2400)	8	0	0.603	0.256	0.355	0.107
<hr/>						
Jun 15 - Aug 31	24	0	1.351	0.666	0.349	0.184

<sup>1</sup> Number of complete trip angler interviews that targeted Arctic grayling.

<sup>2</sup> Number of incomplete trip angler interviews that targeted Arctic grayling.

Table 68. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Tangle River Arctic grayling fishery, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	26	31%	31%	0	0%	0%	52	62%	62%	0	0%	0%
1	8	10%	40%	8	1%	1%	13	15%	77%	13	17%	17%
2	9	11%	51%	18	3%	5%	8	10%	87%	16	21%	39%
3	5	6%	57%	15	3%	8%	6	7%	94%	18	24%	63%
4	4	5%	62%	16	3%	11%	2	2%	96%	8	11%	73%
5	5	6%	68%	25	5%	15%	1	1%	98%	5	7%	80%
6	4	5%	73%	24	4%	20%	0	0%	98%	0	0%	80%
7	5	6%	79%	35	7%	26%	1	1%	99%	7	9%	89%
8	4	5%	83%	32	6%	32%	1	1%	100%	8	11%	100%
9	1	1%	85%	9	2%	34%						
10	3	4%	88%	30	6%	40%						
12	1	1%	89%	12	2%	42%						
14	3	4%	93%	42	8%	50%						
30	1	1%	94%	30	6%	55%						
31	1	1%	95%	31	6%	61%						
32	1	1%	96%	32	6%	67%						
36	1	1%	98%	36	7%	74%						
65	1	1%	99%	65	12%	86%						
74	1	1%	100%	74	14%	100%						
Total	84			534			84			75		

<sup>1</sup> Number of anglers interviewed (complete trip only) that caught or harvested a certain number of Arctic grayling.

<sup>2</sup> Number of Arctic grayling caught or harvested by that group of anglers.

Table 69. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Tangle Lakes Arctic grayling fishery, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
<u>Upper Tangle Lakes</u>												
0	10	42%	42%	0	0%	0%	11	46%	46%	0	0%	0%
1	1	4%	46%	1	1%	1%	3	13%	58%	3	11%	11%
2	4	17%	63%	8	8%	9%	6	25%	83%	12	44%	56%
3	1	4%	67%	3	3%	13%	4	17%	100%	12	44%	100%
4	1	4%	71%	4	4%	17%						
5	3	13%	83%	15	16%	33%						
6	1	4%	88%	6	6%	39%						
7	1	4%	92%	7	7%	46%						
23	1	4%	96%	23	24%	71%						
28	1	4%	100%	28	29%	100%						
Total	24			95			24			27		
<u>Lower Tangle Lakes</u>												
0	14	32%	32%	0	0%	0%	21	48%	48%	0	0%	0%
1	3	7%	39%	3	1%	1%	2	5%	52%	2	3%	3%
2	0	0%	39%	0	0%	1%	4	9%	61%	8	10%	13%
3	5	11%	50%	15	6%	7%	7	16%	77%	21	27%	40%
4	4	9%	59%	16	6%	14%	3	7%	84%	12	15%	55%
5	0	0%	59%	0	0%	14%	7	16%	100%	35	45%	100%
6	3	7%	66%	18	7%	21%						
7	1	2%	68%	7	3%	24%						
8	2	5%	73%	16	6%	30%						
9	2	5%	77%	18	7%	37%						
10	2	5%	82%	20	8%	45%						
11	1	2%	84%	11	4%	50%						
12	1	2%	86%	12	5%	55%						
14	1	2%	89%	14	6%	60%						
16	1	2%	91%	16	6%	67%						
17	2	5%	95%	34	14%	80%						
24	1	2%	98%	24	10%	90%						
25	1	2%	100%	25	10%	100%						
Total	44			249			44			78		

- <sup>1</sup> Number of anglers interviewed (complete trip only) that caught or harvested a certain number of Arctic grayling.  
<sup>2</sup> Number of Arctic grayling caught or harvested by that group of anglers.

Table 70. Estimates of the contributions of each age class and mean fork length (mm) at age of Arctic grayling in the harvest sample at the Tangle Lakes and River Arctic grayling fishery, 1987.

Age	Age Composition			Fork Length	
	n	%	SE	Mean	SE
<u>Tangle Lakes</u>					
3	4	4.9%	2.4%	245	14
4	31	38.3%	5.4%	281	3
5	27	33.3%	5.2%	311	5
6	11	13.6%	3.8%	336	4
7	8	9.9%	3.3%	366	7
Total	81			305	4
<u>Tangle River</u>					
1	1	0.7%	0.7%	172	—
2	9	6.3%	2.0%	183	12
3	34	23.8%	3.6%	235	4
4	70	49.0%	4.2%	266	3
5	22	15.4%	3.0%	304	5
6	6	4.2%	1.7%	334	5
7	1	0.7%	0.7%	335	—
Total	143			262	4

Table 71. Relative stock densities (RSD) of Arctic grayling in the harvest sample at Tangle Lakes and River, 1987.

Category	Range <sup>1</sup>	Tangle Lakes			Tangle River			Combined		
		n	%	SE	n	%	SE	n	%	SE
Stock	150-269	12	14%	4%	81	54%	4%	93	39%	3%
Quality	270-339	57	66%	5%	64	43%	4%	121	51%	3%
Preferred	340-449	18	21%	4%	4	3%	1%	22	9%	2%
Memorable	450-559	0	0%	—	0	0%	—	0	0%	—
Trophy	560-Up	0	0%	—	0	0%	—	0	0%	—
Total		87			149			236		

<sup>1</sup> Range is the fork length range of the RSD category in mm.

Table 72. Demographic profiles of anglers interviewed at Tangle Lakes and River Arctic grayling fishery, 1987.

Angler Characteristic	Tangle Lakes <sup>1</sup>			Tangle River <sup>2</sup>			Tangle System <sup>3</sup>		
	n	%	SE	n	%	SE	n	%	SE
Total Number of Interviews	26	—	—	111	—	—	137	—	—
Male	14	58%	10.0%	81	77%	4.1%	95	74%	3.9%
Female	10	42%	10.0%	24	23%	4.1%	34	26%	3.9%
Adult	19	83%	7.8%	96	91%	2.8%	115	90%	2.7%
Youth	4	17%	7.8%	9	9%	2.8%	13	10%	2.7%
Resident	17	71%	9.3%	92	88%	3.2%	109	84%	3.2%
Non-resident	7	29%	9.3%	13	12%	3.2%	20	16%	3.2%
Local	0	0%	—	1	1%	1.0%	1	1%	0.9%
Non-local	24	100%	—	103	99%	1.0%	127	99%	0.9%
Tourist	8	31%	9.1%	10	9%	2.7%	18	13%	2.9%
Military	0	0%	—	6	5%	2.1%	6	4%	1.7%
Neither	18	69%	9.1%	95	86%	3.3%	113	82%	3.3%
Gear Types:									
Spinners	17	94%	5.6%	40	41%	5.0%	57	50%	4.7%
Bait	0	0%	—	4	4%	2.0%	4	3%	1.6%
Jigs	0	0%	—	47	48%	5.1%	47	41%	4.6%
Trolling	1	6%	5.6%	3	3%	1.7%	4	3%	1.6%
Flies	0	0%	—	3	3%	1.7%	3	3%	1.6%

<sup>1</sup> Angler interviews are from Tangle Lakes between 15 June and 31 August 1987.

<sup>2</sup> Angler interviews are from Tangle River between 15 June and 31 August 1987.

<sup>3</sup> Angler interviews are from Tangle Lakes and River combined.

Table 73. Opinions of anglers interviewed at the lower Tangle Lakes Arctic grayling fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	4	10%	4.6%
	Good (2)	22	54%	7.8%
	Fair (3)	9	22%	6.5%
	Poor (4)	6	15%	5.5%
	Total	41		
	Mean Rating =	2.41		
2. How does current fishing compare to fishing in prior years?	Better	7	19%	6.6%
	Same	6	17%	6.2%
	Worse	9	25%	7.2%
	No Opinion	14	39%	8.1%
	Total	36		
3. Is public boat access adequate?	Yes	31	86%	5.8%
	No	3	8%	4.6%
	No Opinion	2	6%	3.8%
	Total	36		
4. What is your opinion of a minimum length limit for Arctic grayling?	Approve	30	83%	6.2%
	Disapprove	4	11%	5.2%
	No Opinion	2	6%	3.8%
	Total	36		

Table 74. Opinions of anglers interviewed at the upper Tangle Lakes Arctic grayling fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	5	17%	7.0%
	Good (2)	14	48%	9.3%
	Fair (3)	2	7%	4.7%
	Poor (4)	8	28%	8.3%
	Total	29		
	Mean Rating =	2.45		
2. How does current fishing compare to fishing in prior years?	Better	2	11%	7.4%
	Same	2	11%	7.4%
	Worse	6	33%	11.1%
	No Opinion	8	44%	11.7%
	Total	18		
3. Is public boat access adequate?	Yes	17	94%	5.4%
	No	0	0%	—
	No Opinion	1	6%	5.4%
	Total	18		
4. What is your opinion of a minimum length limit for Arctic grayling?	Approve	12	67%	11.1%
	Disapprove	4	22%	9.8%
	No Opinion	2	11%	7.4%
	Total	18		

Table 75. Opinions of anglers interviewed at the Tangle River Arctic grayling fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate the fishing here this year?	Excellent (1)	10	10%	2.9%
	Good (2)	53	51%	4.9%
	Fair (3)	34	33%	4.6%
	Poor (4)	7	7%	2.5%
	Total	104		
	Mean Rating =	2.37		
2. How does current fishing compare to fishing in prior years?	Better	5	9%	3.9%
	Same	21	39%	6.6%
	Worse	21	39%	6.6%
	No Opinion	7	13%	4.6%
	Total	54		
3. Is public boat access adequate?	Yes	40	42%	5.1%
	No	5	5%	2.3%
	No Opinion	50	53%	5.1%
	Total	95		
4. What is your opinion of a minimum length limit for Arctic grayling?	Approve	68	74%	4.6%
	Disapprove	14	15%	3.7%
	No Opinion	10	11%	3.2%
	Total	92		

## CHAPTER 14 - WOOD CREEK COHO SALMON FISHERY

### Introduction

A coho salmon sport fishery occurs on Wood, Clear, and Julius Creeks from approximately the middle of September to the middle of October. The primary fishery is located on Wood Creek (Figure 11). Wood Creek is located just south of Clear between the town of Clear and Clear Air Force Base. Wood Creek is a tributary of Julius Creek that flows into the Nenana River, just south of Nenana. Wood Creek supports a late fall run of anadromous coho salmon. Fisheries Rehabilitation, Enhancement, and Development (FRED) Division has supplemented this fall run with hatchery raised fingerling coho salmon. To monitor these stocks, FRED Division operates a weir during the late part of September and early part of October. Recently, a small sport fishery has developed. This creel census was designed to be conducted in conjunction with the weir operation. The goal of the creel census is to provide baseline information on the developing fishery that includes CPUE, HPUE, catch, harvest, harvest sampling, and angler characteristics.

### Methods

Access to Wood Creek is by walking about 1/2 mile from the road between Clear and Clear Air Force Base (Figure 11). There is also some fishing that occurs at the confluence of Wood and Julius Creeks, at Herman Shores Landing. The angler effort at Herman Shores Landing is assumed to be negligible. From previous weir operations, the majority of the angler effort is expended within 1/2 mile of either side of the weir on Wood Creek. The creel census is a stationary harvest survey. The creel census is conducted in conjunction with the FRED Division weir operation.

This sport fishery primarily occurs on the weekends. The sport fishing during the week occurs primarily during the afternoon and evenings. Therefore, fishing days for weekdays and weekends are defined to occur from 1000 to 2000 hours on weekdays and 0800 to 2000 hours on weekends. The sample design uses two strata for each week: (1) weekdays 1000 to 2000 hours and (2) weekends and holidays 0800 to 2000 hours. Since weir personnel were at the weir all day, angler counts were conducted at two to four randomly selected times each day. The number of counts conducted depended on the amount of time the weir personnel had available. Anglers were counted by walking about 1/2 mile on both sides of the weir. Counts took about 30 minutes to conduct.

All anglers within sight of the weir were interviewed at the completion of their fishing trip. Anglers not within sight of the weir were interviewed when encountered during an angler count.

### Results and Discussion

The Wood Creek creel census was conducted from 25 September through 12 October 1987. During the creel census, 44 angler counts were conducted and 120 anglers were interviewed (Table 76). All interviews were from anglers who had completed their trip. Estimated angler effort was 522 hours, of which 33% was expended 5 October through 9 October. Estimated coho salmon CPUE was 0.53

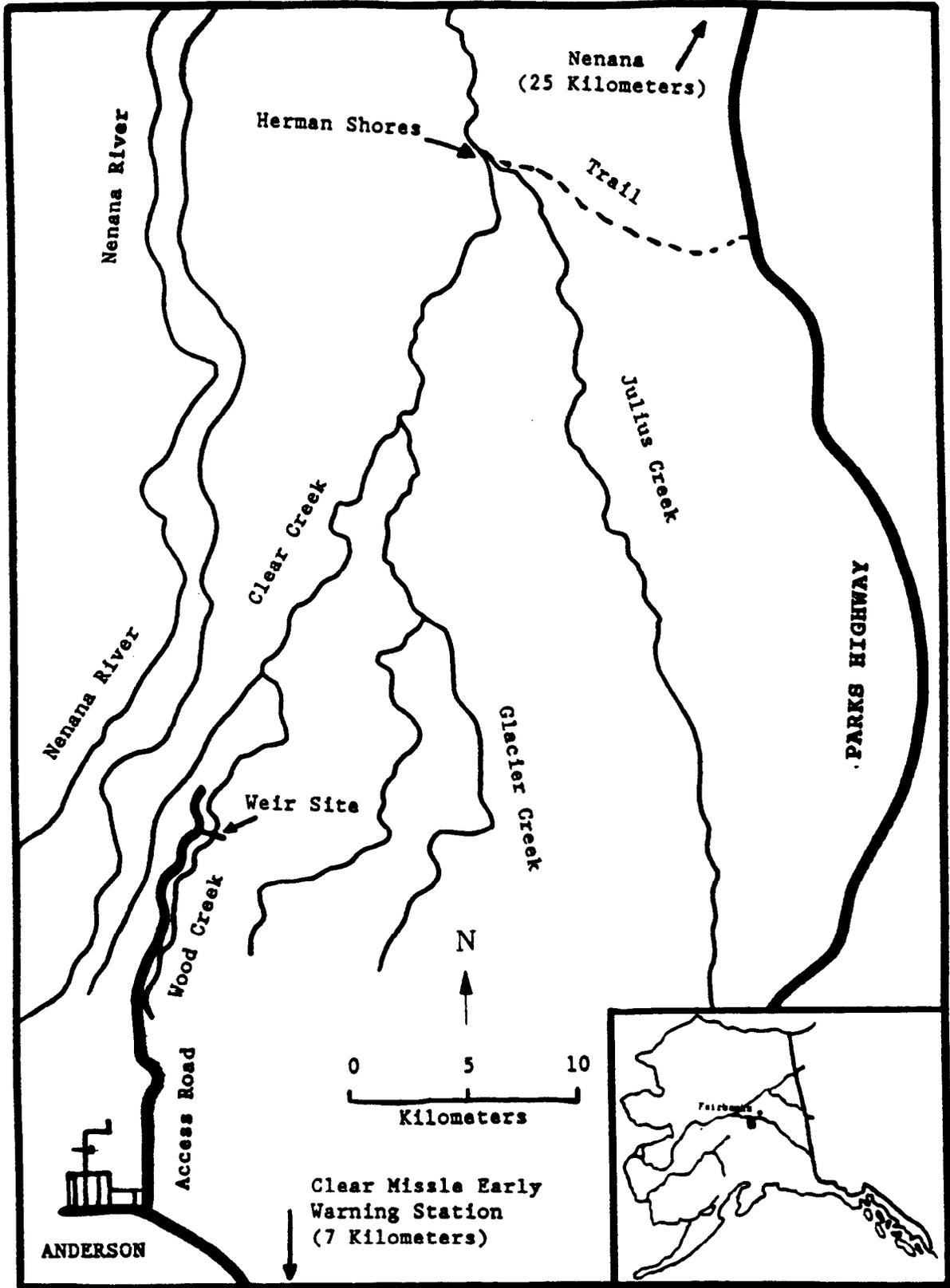


Figure 11. Location of Wood Creek coho salmon fishery, Nenana River drainage, Alaska

fish per hour and estimated HPUE was 0.37 fish per hour. Both CPUE and HPUE peaked during the week of 28 September to 2 October. An estimated total of 247 coho salmon were caught with 195 coho salmon harvested. Almost 40% of the harvest occurred during the weekend of 3 and 4 October 1987.

Few anglers did not catch (8%) or harvest (17%) any coho salmon (Table 77). Distribution of catch and harvest among anglers was almost evenly distributed between anglers who caught and harvested one, two, or three coho salmon. Anglers who caught or harvested three or fewer coho salmon accounted for 57% of the catch and 100% of the harvest.

Relative stock densities, by sex, were estimated from the harvest sample of coho salmon (Table 78). For both sexes, the majority of the coho salmon are quality size (73% for males, and 89% for females). Males are a little bigger with 17% of the fish preferred size and 1% memorable size while 6% and 0% of females were in the preferred and memorable size categories, respectively.

Of the 120 anglers interviewed at Wood Creek, 90% were males, 99% adults, 98% residents of the State of Alaska, 98% not from the Nenana area (Clear), 86% were military, and 100% used spinners as their terminal fishing gear type (Table 79). None of the anglers were tourists. These same anglers gave the fishery a mean rating of 1.69; a good to excellent rating (Table 80). Forty-six percent said the fishing was excellent while 39% said it was good. Only 15% said the fishery was fair and no anglers gave the fishery a poor rating.

Table 76. Number of angler interviews and angler counts, and estimates of angler effort (hours), CPUE (catch per hour), HPUE (harvest per hour), catch, and harvest of anadromous coho salmon at Wood Creek, 1987.

Strata	Angler Effort		Angler Interviews			CPUE		HPUE		Catch		Harvest	
	n <sup>1</sup>	Hours	SE	C <sup>2</sup>	I <sup>3</sup>	Mean	SE	Mean	SE	Total	SE	Total	SE
Sep 25 - Sep 27	15	104	23	40	0	0.39	0.00	0.27	0.00	41	9	28	6
Sep 28 - Oct 2	10	85	37	14	0	1.44	0.24	0.66	0.03	122	56	56	24
Oct 3 - Oct 4	13	78	33	42	0	0.17	0.00	0.17	0.00	13	6	13	5
Oct 5 - Oct 9	4	175	114	14	0	0.43	0.04	0.43	0.04	75	49	75	49
Oct 10 - Oct 12	2	80	0	10	0	0.28	0.09	0.28	0.09	22	7	22	7
Sep 25 - Oct 12	44	522	59	120	0	0.53	0.11	0.37	0.04	274	76	195	56

<sup>1</sup> Number of instantaneous hourly angler counts.

<sup>2</sup> Number of completed trip angler interviews.

<sup>3</sup> Number of incompleted trip angler interviews.

Table 77. Distribution of anadromous coho salmon catch and harvest among anglers interviewed at the Wood Creek coho salmon fishery, Nenana River drainage, 1987.

Number of Fish	Catch						Harvest					
	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm	n <sup>1</sup>	%	Cumm	n <sup>2</sup>	%	Cumm
0	9	8%	8%	0	0%	0%	18	17%	17%	0	0%	0%
1	31	29%	38%	31	10%	10%	31	29%	46%	31	17%	17%
2	27	25%	63%	54	18%	28%	24	23%	69%	48	27%	44%
3	29	27%	91%	87	29%	57%	33	31%	100%	99	56%	100%
5	1	1%	92%	5	2%	58%						
6	1	1%	92%	6	2%	60%						
8	1	1%	93%	8	3%	63%						
12	2	2%	95%	24	8%	71%						
15	2	2%	97%	30	10%	81%						
18	1	1%	98%	18	6%	87%						
20	1	1%	99%	20	7%	93%						
21	1	1%	100%	21	7%	100%						
Total	106			304			106			178		

<sup>1</sup> Number of anglers interviewed that caught or harvested a certain number of coho salmon.

<sup>2</sup> Number of coho salmon caught or harvested by that group of anglers.

Table 78. Relative stock density (RSD) of anadromous coho salmon from the harvest sample at Wood Creek coho salmon fishery, 1987.

Category	Range <sup>1</sup>	n	%	SE
<u>Males</u>				
Stock	400-499	12	9.0%	2.5%
Quality	500-599	98	73.1%	3.8%
Preferred	600-699	23	17.2%	3.3%
Memorable	700-799	1	0.7%	0.7%
Trophy	800-above	0	0.0%	—
Total		134		
<u>Females</u>				
Stock	400-499	3	5.8%	3.2%
Quality	500-599	46	88.5%	4.4%
Preferred	600-699	3	5.8%	3.2%
Memorable	700-799	0	0.0%	—
Trophy	800-above	0	0.0%	—
Total		52		
<u>Combined</u>				
Stock	400-499	15	8.1%	2.0%
Quality	500-599	144	77.4%	3.1%
Preferred	600-699	26	14.0%	2.5%
Memorable	700-799	1	0.5%	0.5%
Trophy	800-above	0	0.0%	—
Total		186		

<sup>1</sup> Range is the fork length range of the RSD category in mm.

Table 79. Demographic profile of anglers interviewed at the Wood Creek coho salmon fishery, 1987.

Angler				Angler			
Characteristic	n	%	SE	Characteristic	n	%	SE
Total Number of Interviews	120	—	—	Local	2	2%	1.3%
				Non-local	115	98%	1.3%
Male	108	90%	2.7%	Tourist	0	0%	—
Female	12	10%	2.7%	Military	103	86%	3.2%
Adult	118	99%	0.9%	Neither	17	14%	3.2%
Youth	1	1%	0.9%	Gear Type:			
Resident	114	98%	1.3%	Spinners	117	100%	—
Non-resident	2	2%	1.3%				

Table 80. Opinions of anglers interviewed at the Wood Creek coho salmon fishery, 1987.

Question	Opinion	n	%	SE
1. How would you rate fishing here this year?	Excellent (1)	53	46%	5.1%
	Good (2)	45	39%	4.6%
	Fair (3)	17	15%	3.3%
	Poor (4)	0	0%	—
Total		115		
Mean Rating =		1.69		

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